ONTARIO'S VALUE-ADDED WOOD PRODUCTS MARKET POTENTIAL IN THE U.S. GREAT LAKES STATES

VOLUME 1
MAIN REPORT

Prepared for the Living Legacy Trust
December 2003

WOODBRIDGE ASSOCIATES INC.
In association with Clayton Research Associates

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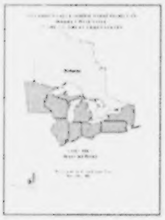
Preface

This report has been prepared for Ontario's Living Legacy Trust under Phase II of Funding Program 6. The report comprises the following documents:



VOLUME 1
Main Report

VOLUME 2
Industry Profiles

VOLUME 3
Product Benchmarks

See websites:
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www.olma.ca
www.woodbridgeassociates.com

VOLUME 4
Opportunities Report

Available only to Qualified Users. See footnote [1]

For enquiries about this report and consulting services, please contact:

Peter Woodbridge
President
Woodbridge Associates Inc.
1084 Eyremount Drive
West Vancouver, BC
(604) 922 4090 (office)
(604) 970 7784 (cellular)
pw@woodbridgeassociates.com

Peter Norman
Vice-President
Clayton Research Associates Ltd.
1580 Kingston Road
Toronto, ON
(416) 699 5645 (office)
(416) 994 9467 (cellular)
pnorman@clayton-research.com

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[1] For competitiveness reasons, Volume 4 *Opportunities Report* is available only to firms that have operations within Ontario. Please contact Karan Aquino, Executive Director of the Living Legacy Trust www.livinglegacytrust.org

Introduction

This multi-volume report focuses on the export market outlook for three specific product groupings produced in Ontario:

Group A: Wood Building Components
Group B: Millwork
Group C: Factory-Built Structures

The goals of this study are to identify dominant and growth products within each of these three product groups. It is intended that the study will help Ontario's manufacturers identify intermediate and end-use markets for at least the dominant and growth products, and link these to increased trade between Ontario and the United States.

Scope and Layout of the Report

'*Volume 1 Main Report*' provides detailed analyses of export market opportunities in the Great Lakes region for the three sub-groups of Ontario's wood product manufacturing industry. Volume 1 also presents our evaluation of Ontario's competitiveness in these product groups compared with other suppliers. Conclusions are presented for (a) strategic issues and (b) operating issues that might impede Ontario's ability to capture these growth opportunities. Volume 1 contains our recommendations for follow-up initiatives and an Executive Summary.

'*Volume 2 Industry Profiles*' provides a summary of data relating to the industry size, shipments and product-mix profile of the Ontario wood products industry. These are used as a base for the analyses presented in Volume 1. It also presents a profile of the structure and shipments of the wood products industry in the U.S Great Lakes region relating to the three groups of products identified above.

'*Volume 3 Product Benchmarks*' forms part of this series. It presents an overview of Ontario's wood product exports to the Great Lakes. Benchmark data are provided summarizing Ontario's exports to each state. Volume 3 also presents economic profiles of the eight Great Lakes states with demographic and construction industry projections to 2010 and 2020. These provide a basis for our forecasts of future demand.

Finally, '*Volume 4 Opportunities Report*' presents additional details of the specific opportunities discussed in Volume 1 along with an analysis of the economic, financial and policy implications of the growth projections.

Volumes 1-3 are available to the general public from the Living Legacy Trust. Volume 4 is available only to firms that have operations within Ontario.

A *Glossary of Terms Used* is provided in Appendix A.

IMPORTANT NOTES & DISCLAIMER

The Consultants have prepared these reports on the basis of the best available information and provide these findings in good faith with the intended goals as stipulated in the terms of reference. The Consultants do not accept any responsibility for any decisions taken directly or indirectly, in whole or in part, based on information or findings contained in the report. Users of the information are advised to verify all data and analyses for themselves before proceeding with any course of action that appears merited by the analyses and conclusions provided.

The Living Legacy Trust

The *Living Legacy Trust* is a $30 million fund established by the Province of Ontario to invest in natural resource management projects in northern Ontario. The assets of the Trust are managed by an independent Board of Directors which represents various stakeholder groups. Projects receiving funding will bring economic, social and recreational benefits to the people of Ontario and serve as models of excellence in forestry, fish and wildlife practices.

Value-Added Committee Members

Value-Added Committee members acting as advisors on the Phase II study include the following.

Steve Banducci
Forest Business Analyst – Forest Business and Economics Section
Ontario Ministry of Natural Resources

Bill Kissick
Manager, Forest Business and Economics Section
Ontario Ministry of Natural Resources, Forests Division

Beth Litchfield
Northern Development Adviser, Natural Resources – Sudbury and Area
Ontario Ministry of Northern Development and Mines

Ian McCormack
Vice President, Community Development & Innovation
Confederation College

David Milton
President
Ontario Lumber Manufacturers Association

Maureen Prendiville
President
Kenora Forest Products Ltd. / Prendiville Industries

Reino Pulkki
Dean, Faculty of Forestry and the Environment
Lakehead University

Bob Seguin
Assistant Deputy Minister, Employment and Business Development Division
Ontario Ministry of Enterprise, Opportunity and Innovation

Karan Aquino
Executive Director
Living Legacy Trust
www.livinglegacytrust.org

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Executive Summary

Ontario's wood products and value-added wood manufacturing sector is one of the most important and substantial contributors to the provincial economy, both in northern Ontario and the south, but is significantly under-rated.

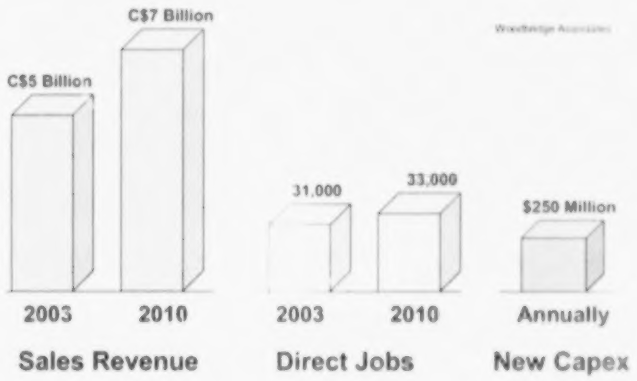
It has good prospects for sustainable growth, averaging 7% sales increase per year.

The best opportunities are (1) upgrading of existing eastern-SPF primary wood products (dimension lumber) and increased output of MSR and fingerjoint lumber, (2) a significant expansion in value-added capacity, notably structural engineered wood products (EWP) and building components (lumber-flange I-Joists, open web joists and wall panels), and (3) technological leadership in factory-built housing systems.

Market potential for Ontario wood products in the US Great Lakes states is identified in this report. Achieving the growth assumes that the primary wood products sector will invest in modernization and a significant shift in its product-mix. A constant softwood harvest is assumed.

Chart 1

Financial Implications of Ontario's Growth Potential in Wood Products and Value-Added Manufacturing



The magnitude of these opportunities is substantial. Over the next several years, the value of the sector's total shipments could increase by 40%, from an estimated C$5 billion in 2003 to C$7 billion by the year 2010 (Chart 1). Rising product prices (average 2% annually) would increase this gain.

Direct employment in the wood products and value-added wood manufacturing sector currently is estimated at around 31,000 employees. When all forest industry direct and indirect jobs are taken into account, including logging, pulp and paper, it is estimated that total employment in the timber resource-based economy is around 180,000 persons, or 1 in 31 employed Ontarians.

Growth of the sector to 2010 will create new jobs in northern Ontario, but through capital investments in larger scale plants and automation in the south, the net new jobs gain for the province overall will be modest.

This is an important under-pinning for the significant gains in productivity that are possible in several key manufacturing sub-sectors. If future state-of-the art manufacturing facilities located in Ontario and employing younger generations of computer-skilled workers are to be globally competitive, high levels of productivity using automated equipment are vital.

Some of the world's largest wood products companies have manufacturing operations within Ontario. Weyerhaeuser, for example, recently invested C$260 million[2] in a state-of-the-art world class structural engineered wood product (EWP) plant in Kenora, ON.

We estimate that the order-of-magnitude level of *incremental* capital spending required to (a) upgrade existing sawmills in the province and (b) invest in more manufacturing capacity in structural EWPs and value-added building components will be close to C$250 million annually, or the equivalent of one new Kenora EWP plant every year until 2010.

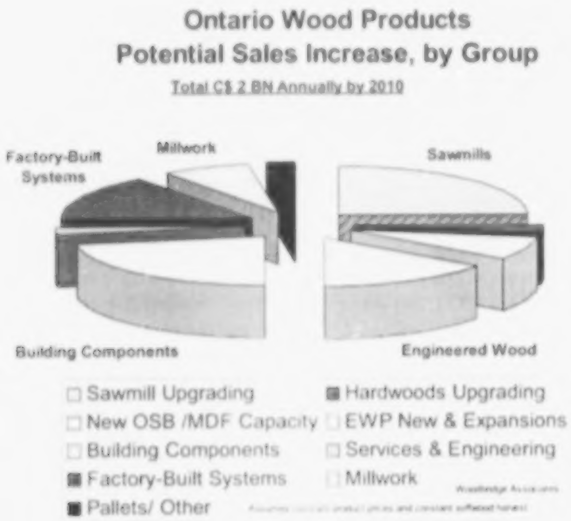
Significant new investment will be required in manufacturing technology R&D, education and skills training and marketing. Skills training should focus on construction design, engineering and building systems. Ontario's access to skills training facilities is excellent, but under-funded.

Summary of Sales Growth Opportunities

By 2010, increased sales would come from five areas. Four of these are related. Ontario's sales to the Great Lakes and its expansion in building components, some types of engineered wood and factory-built housing systems, would be facilitated by a substantial upgrading of Ontario's sawmill industry. From a market and product quality perspective, this is long overdue.

Capacity growth in other products would not be linked to an upgrading of Ontario's sawmills. These include LSL, OSB and MDF as well as wood windows and doors (Chart 2).

Chart 2



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[2] Source: *Logging & Sawmilling Journal* (February 2003)

Some of Ontario's sawmills are modern, large scale and comparatively efficient. Many others are not. Upgrading those that can be economically viable is necessary to (a) improve US export product quality and (b) better meet the needs of Ontario's construction markets and value-added sector.

Ontario substantially increased its softwood lumber production during the past decade. Much of the increased volume is sold to the Great Lakes markets. Unlike Quebec, however, the Ontario lumber industry has not invested extensively in faster growth products such as machine stress rated (MSR) lumber, fingerjoint studs and overall quality upgradings. Part of Ontario's output is green lumber. Kiln dried quality is perceived in the marketplace to be inferior to western SPF. At some mills, target sizes are too tight because the mill focuses excessively on volume throughput rather than quality. The level of skip on dressed lumber is unacceptably high and lumber frequently varies widely in its moisture content.

This is not a good base of supply for sustainable exports. Nor can it meet the needs of Ontario's non-integrated value-added wood product manufacturers, many of whom now purchase their materials from outside the province. The province loses the benefits of industrial synergies and cost savings that could be available if sub-sectors were more closely linked to each others' needs.

In the past, the largely export-focused lumber, OSB and MDF industries did not have to be unduly concerned about domestic market customers. With the prospect of renewed softwood lumber quotas under a possible new trade agreement ("SLA II"), sawmills will not be able to export the volumes they would wish to the United States. There will be a struggle to obtain quotas.

Under "SLA II", Ontario sawmills will be able to operate at higher rates of capacity utilization and export their higher grades of dimension lumber to the US using quota, if they improve the quality of products sold to the US and to Ontario's domestic producers of value-added wood products.

Many non-integrated producers of EWPs, building components (wood trusses, I-Joists and wall panels), factory-built housing and millwork depend for their competitiveness on continuation of the low value of the Canadian dollar in US funds. They have several strategic options for growth and reduced dependence on the currency advantage. An important strategy option is for the Ontario wood products industry to become a technology leader in the high growth products identified.

The Great Lakes Market

This region is Ontario's most important market area for wood products and value-added exports. Total population in the region is 83 million persons, or about the population of Germany.

Chart 3

U.S. Great Lakes Region
- Target Market Area
Minnesota
Wisconsin
Michigan
New York
Pennsylvania
Illinois
Indiana
Ohio

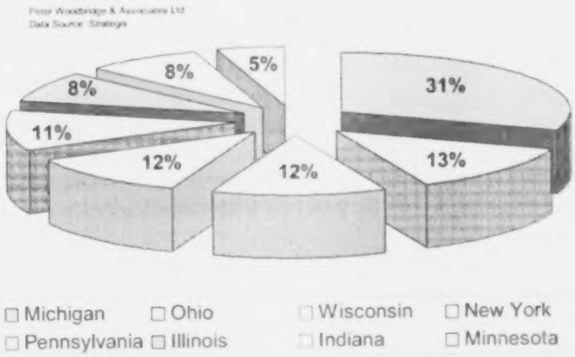
Peter Woodbridge & Associates and Clayton Research

The Great Lakes region has many distinct sub-markets and consumption of value-added wood products can vary widely. No single manufacturing region of North America dominates supply. The buyer has many choices. High levels of product and species displacement take place.

As the traditional manufacturing heartland of the United States, the Midwest/Great Lakes region has achieved an economic renaissance, but suffers from construction labour shortages. The site-built residential and non-residential construction industries are extensive users of labour saving engineered wood and off-site fabricated building components, ready-to-install window and door units, unitized millwork items and factory-built modular homes. This is good for Ontario.

Chart 4

Michigan is the Largest Overall Market Area for Ontario's Wood Product Shipments to the Great Lakes


Peter Woodbridge & Associates Ltd
Data Source: Strategis

Michigan is Ontario's most important market within the region (Chart 4) accounting for 31% of the province's shipments in 2002. Ohio, Wisconsin and New York are other important markets. The 'Top 4' account for a combined 68% of all Ontario's wood products shipments to the region.

Housing demand is substantial. Population growth and housing starts are higher in the US South and South-West, but average personal incomes in the Great Lakes are about 3% better than the national average. Population growth in the Great Lakes states has lagged behind the U.S. overall, as domestic retirees continue to migrate toward the South and South West.

Construction industry expenditures in the Great Lakes create strong demand for building materials. Non-residential construction makes up 59% of total expenditures compared with 41% for homebuilding. Steel and concrete dominate non-residential construction (there is scope for greater use of wood) and major parts of the multi-family residential construction market.

The Great Lakes residential market is a large consumer of wood and the fight for market share is between (a) traditional products, such as solid dimension lumber and plywood, and engineered wood products in structural markets, (b) different species, and (c) suppliers from various North American regions versus fast-growing offshore suppliers including Chile, Brazil and New Zealand in non-structural products such as millwork. It is widely known that imports from China now dominate the US furniture market (furniture is not part of this study). Less well known are the sizeable impacts that imports from offshore are having on the North American millwork industry.

Much of North America's HUD Code manufactured housing capacity is located in the Great Lakes, notably in clusters in Indiana. Other centres of excellence exist in modular residential housing (e.g. Pennsylvania). The region also has a well developed roof and floor truss industry. Large efficient wall panelizers and factory-based custom homebuilders, such as Wausau Homes, are located within the region. Ontario still maintains a significant market share in the supply of building components, including I-Joists, trusses and wall panels. These are the types of technologies in which much of the province's future competitiveness in value-added wood product exports exists.

The Great Lakes region is an extensive consumer of wood windows and doors, mouldings and other millwork. As a result, many of the world's largest and most advanced windows and doors producers (e.g. Andersen Windows) are located there[3]. Ontario's wood windows and doors industry is increasing its market share in selected markets.

With changes, there are numerous opportunities in the Great Lakes market for Ontario producers to sell more of their existing and new products, and opportunities for strategic alliances and joint ventures with US producers, distributors and construction firms.

Strategic Initiatives

In order to be cost and service competitive, Ontario producers cannot continue to rely on Canada's exchange rate advantage. Emphasis must be on improved product quality, service and technical support.

In addition, to achieve low unit costs, Ontario's wood products and value-added manufacturers will have to invest significantly in automation for productivity gains and become technology leaders in their manufacturing core competencies. Major investments in education, skills training and technology transfer will be necessary. For effective sales, spending on market research and new product development will be essential. Innovation by the industry generally is low.

Ontario has potential, but seems to lack the vision that its wood products and value-added manufacturers can become globally competitive and a world leader in selected product groups. In many ways, Ontario is over-shadowed in the wood products manufacturing business by Quebec and British Columbia.

Northern Ontario is a potential area for future wood products manufacturing development. This is a vast geographical area with considerable timber and people resources. Value-added manufacturing industry development in the north presents special logistical and other challenges, and cannot be divorced from the region's integrated wood products industry.

In the following tables, we summarize product-market opportunities for Ontario in three main groups. In addition, because of the strong linkages between certain areas of value-added manufacturing competitiveness and the resource-based primary wood products industry, we discuss the implications for the Ontario's wood industry as a whole.

The three groups are:

Group A: Structural Building Products

Group B: Millwork

Group C: Factory-Built Housing

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[3] Pella Windows is located in Iowa, just outside the Great Lakes region.

Group A: Structural Building Products

Table 1
Group A: Structural Engineered Wood & Building Components Opportunities

Sub-Sector	Ranking of Growth Prospects for Ontario	
	Immediate Commercial Opportunities	Longer Term Potential
Structural Floors	#1	#1
Structural Exterior Walls	#2	#2
Structural Roof Systems		#3
Rim Boards	#5	#6
Headers	#6	#5
Structural Beams	#4	#4

Source: Section A. For details of product and services opportunities, see Volume 4 *Opportunities Report*.

Table 1 presents immediate and longer term priority rankings for the growth product opportunities identified in the Phase II reports. Columns should be read vertically. For immediate action, the best commercial prospects in value-added wood products for Ontario are #1 structural floor systems, including I-Joists and open web wood trusses; #2 structural exterior walls (panelized walls and SIPs) tied jointly with structural roof systems (wood trusses and SIPs); #4 structural beams (strong growth in TimberStrand); #5 OSB and TimberStrand rim boards and #6 factory-built headers.

Dimension lumber will fight strongly to retain its dominant share of many of these markets, based on price and improvements in product quality and technical service. New "middle market" products, notably laminated items, can be expected to emerge and challenge some of the higher cost EWPs. Where appearance and aesthetics are important, architectural timbers will continue to challenge large laminated, three-dimensional beams notably in higher-end markets.

Longer term growth options are: (#1) structural floor systems, notably complete off-site fabricated modular units; (#2) structural exterior walls (with strong growth in semi-open and growing demand for closed panelized walls); (#3) structural whole roof systems and structural beam assemblies fabricated off-site; (#4) some new generation laminated beams; (#5) new-technology factory-built short and medium length headers; and (#6) low cost OSB and TimberStrand rim boards continuing to displace plywood, LVL and re-sawn glulam. Feature timbers and structural appearance products will continue to enjoy growth of market share outside the single-family market, in lodges, rural hotels and a wide range of commercial buildings.

We expect to see increased acceptance, within the current decade, of partial and full-home building systems notably among large tract builders. Technological pioneering will be driven by homebuilding "Giants", such as Centex and Pulte, and by some of the pioneering medium scale homebuilders who increasingly will be driven by opportunities to (a) introduce customization in design along with automation in construction and (b) squeeze out costs from the supply chain. Details of product opportunities along with manufacturer-distributor and manufacturer-homebuilder strategic alliance opportunities are provided in Volume 4 *Opportunities Report*[4].

Group B: Millwork

Group B is millwork[5], which includes wood windows, doors, mouldings and flooring. Group B does not include countertops, kitchen cabinets, non-structural overlaid panels or wood furniture which were excluded from the terms of reference for this report.

Ontario is well represented in several millwork products, as defined above. For example, it is the home base of one of the world's largest door manufacturers, Masonite International Corporation, formerly Premdor (Mississauga, ON). The headquarters of the Royal Group of Technologies is a major supplier of mouldings. The group recently expanded its plant capacity at Woodbridge, ON. Alexandria Mouldings is also a significant producer, notably in MDF mouldings. Sauder is another Canadian player, but most of its production capacity growth is in the US.

Within Ontario, the millwork sector does not depend for its supplies on the province's wood producing industries. The same "disconnect" is evident in the US where millwork plant locations are no longer tied strongly to domestic and traditional wood sources (e.g. Ponderosa Pine in the West). Windows and doors producers use wood, but also use extensive volumes of non-wood materials (e.g. vinyl, fibre-glass, metal and composites). In these products, Ontario competes with some of the world's other largest and most efficient manufacturers located in the Great Lakes states and elsewhere which have their strength in extruded plastics and metals, along with distribution, and which increasingly source their wood needs from overseas.

Despite the province's strong connection with the "marquee" names outlined, most of the high volume production manufacturing capacity of these larger firms is located outside Ontario and outside Canada. Masonite, for example, operates 70 plants in twelve countries. Just like Ikea in Sweden, the business has become global.

Among smaller businesses (SME's), many millwork businesses are family owned and entrepreneurial and are able to develop specialty and/or customized markets. Even so, they may have facilities outside Ontario or operate as branches of US and overseas firms. Custom millwork is labour-intensive and, by serving niche markets, the custom manufacturing sector within Ontario is one of the province's export market success stories.

Except for high-value specialty products, there appear to be no compelling industrial synergies between Ontario's millwork industry and its wood products industry. The windows and doors sector has few remaining linkages with the province's comparatively limited resources of high-value hardwoods. Other millwork has only weak linkages to the province's non-structural panelboards production (e.g. MDF) and very little direct connection, in most cases, with Ontario sources of hardwood or softwood lumber.

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[4] Volume 4 is available only to firms that have operations within Ontario Please contact www.livinglegacytrust.org

[5] The kitchen cabinets countertops and bathroom fittings sector is not included under millwork and was excluded from our analyses

Masonite has an ownership position in Sacopan Inc, a joint venture which has links to a Quebec sawmill group and state-of-the-art plant producing wood composite moulded door facings[6]. But only about 10% of Masonite's requirements for MDF are purchased from Ontario – the balance comes from outside North America. Its requirements are for MDF components, not raw sheets, but Ontario does not appear to be competitive in these value-added areas.

There are some isolated instances of strong entrepreneurial flair within Ontario's primary wood products sector, for example, linking primary wood products with the millwork and wood flooring sector. Kruger has developed an innovative, water-resistant, sub-floor panel product called 'Dricore', using OSB, veneer and non-wood materials. There are few manufacturing clusters in northern Ontario available to support these types of initiatives and provide any significant degree of competitive leverage.

Technology Transfer

Through technology transfer, there is a potential connection between Ontario's millwork industry and its wood products industry. This is in the area of building systems. Specifically, Royal Building Technologies, a division of the Royal Group, has applied its non-wood technologies to build single family homes[7] in the US and the potential exists for this initiative to be tied into Ontario's potential in whole building systems. On the other hand, Masonite, which since 1960 has operated one of the world's largest private wood technology laboratories with over 100 employees, chose to locate this facility in Chicago, IL. The balance of competitiveness in this respect appears to be in favour of the US Great Lakes as the leading-edge supply area.

We conclude, overall, that the millwork industry in Ontario is virtually a separate business from the wood product groups considered in this report. Domestic and US Great Lakes export market growth will continue to occur for Ontario's millwork manufacturers, notably in wood windows and doors, but in most instances, will not depend on, nor provide substantial growth opportunities for, Ontario's resource-based communities for the foreseeable future.

Table 2

Group B: Millwork Product-Market Opportunities

Sub-Sector	Ranking of Growth Potential for Ontario	
	Immediate Commercial Opportunities	**Longer Term Potential**
Doors including moulded wood & high-end wood doors	#1	#2
Wood windows including wood-composite combinations	#2	#3
Other millwork, including engineered wood flooring and/or sub-flooring	#3	#1

Source: Section B. For details of product and services opportunities, see Volume 4 *Opportunities Report*

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[6] *'Masonite International Corporation Invests in Sacopan Inc.'* CCN Mathews Press Release, Dec 9 2002

[7] 2002 Sales, Marketing and Builder Conference in Toronto. See www.royalgrouptech.com

Table 2 presents immediate and longer term priority rankings for the growth product opportunities identified in the Phase II reports. Columns should be read vertically. For immediate action, the best commercial prospects for Ontario are: (#1) high volume production doors and windows; (#2) customized doors and windows, and (#3) other value-added millwork. Discussion of these opportunities is provided in Section B of this report and in Volume 4.

Longer term growth options are: (#1) potentially strong growth in engineered wood floors and complete flooring systems (with value-added from installed sales); (#2) other millwork, and (#3) high production and custom wood windows and doors. Ontario has an opportunity to develop its higher value appearance hardwoods as face veneers in support of its millwork sector, and we recommend this for immediate policy attention in order to ensure longer term supply to the industry.

Group C: Factory-Built Housing

Group C comprises two distinct sub-sectors. HUD Code homes were developed in the US after 1973 through an inspired pre-emptive code that facilitated construction of plants and nation-wide shipment of low cost housing (mobile homes). These are defined by the HUD Code in the USA and by CSA Z240 standards in Canada. Large parts of the US capacity and production expertise in this technology are located in the Great Lakes.

A factory-based industry exists based on standard building codes for conventional housing (state and local building codes under BOCA, ICBO and, in future, the International Residential Code) in the United States, and by CSA A277 in Canada.

The modular industry includes residential producers, such as Guildcrest, Quality Homes and Royal Homes in Ontario and pre-cut home manufacturers, such as Viceroy, in which Ontario is well represented from a Canadian capacity viewpoint. The industry as defined in this report excludes modular non-residential housing and commercial portable structures.

Modular homes have several advantages but, as 3-dimensional structures, cannot be transported easily very far by road. In the US, combinations of pre-cut panelized components and modular sections are designed to meet transportation regulations and stay within state highway limitations and further scope exists for this approach.

Off-site fabricated panels subsequently assembled on-site are a faster growing technology than fully assembled modular homes or modular units. There is some potential overlap in the production of off-site fabricated wall panels by truss manufacturers and panelized components producers (see Group A products) and the capabilities of the factory-built housing sector. The latter focuses on design and manufacturing of complete buildings, but Ontario's pre-cutters and modular producers could become suppliers of panelized components sold directly to homebuilders in the US Great Lakes.

A shift from site-built construction methods to off-site and factory-built methods is underway. Panelized components and structural insulated panels in particular offer many advantages, and their share of North America's new housing needs will continue to increase. They consume significant volumes of lumber and, potentially, value-added building materials.

However, the reality is that the site-built homebuilding industry defines the pace at which this transition will occur. The US has many thousands of homebuilders. Consolidation is taking place. "Giants" such as Centex, Pulte, Lennar and KB Homes are emerging, but it is still a highly fragmented industry. Traditional site-based construction is a comparatively inefficient and expensive method of construction. Significant productivity gains are being achieved, in part, through the use of new materials.

Along with supply-chain changes, EWP and value-added building components are a key part of the site-built productivity gains. Eventually, homebuilders' need for per square foot cost reductions will shift the momentum to off-site fabrication and factory-built approaches. These are important export markets for Ontario, but currently, the province's suppliers respond more closely to the larger market represented by the US site-built housing industry.

Today, leadership in factory-built components construction largely is in the hands of US based firms. Pulte is setting up its own regional component-supply centres nationwide and is a pioneer in offsite fabrication for the single family homebuilding industry (through Pulte Home Sciences) and may apply this also to the multi-family sector.

Within Canada, firms such as Mattamy Homes are pioneering linkages back to their own supply sources of panelized components. In modular and/or pre-cut technology, firms such as All American Homes, Wausau Homes and Genesis Homes are setting the technological standard. Ontario factory-builders lag behind the North American leaders, but with vision and concerted actions, the province has the potential to become a world leader in shelter technology.

A significant opportunity awaits Ontario if it can link its 'Group C' value-added manufacturing technology and market growth potential with slower growing structural wood products manufacturing firms in 'Group A', some of which have exceptional strengths in distribution, and mill efficiencies.

Table 3

Group C: Factory-Built Structures Product-Market Opportunities

Sub-Sector	Ranking of Growth Potential for Ontario	
	Immediate Commercial Opportunities	Longer Term Potential
Ontario's OSB, lumber, engineered wood (e.g. TimberStrand) and building components industry	#1	#1
HUD Code MH Structures [CSA Z240 units]	#4	#4
Residential Modular Housing [CSA A277 units]	#2	#3
Panelized Walls and Pre-Cut Homes [CSA A277 units] (excluding log homes)	#3	#2

Source: Section C. For details of product and services opportunities, see Volume 4 *Opportunities Report*.

Table 3 presents immediate and longer term priority rankings for the growth product opportunities identified in the Phase II reports. Columns should be read vertically. For immediate action, the best commercial prospects for Ontario are increased exports of primary wood products, structural EWPs and building components to the US Great Lakes factory-built housing industry. This is an area where strategic alliances are very possible between the Top 5 US factory-builders and Top 10 US homebuilders, on the one hand, and Ontario wood products and value-added manufacturers on the other.

In comparison with the US Great Lakes factory-built housing industry, and its very competitive manufacturing clusters (e.g. Indiana), Canada's residential modular housing industry is small-scale and less able to handle the high-volume needs of large production builders. Export sales from Canada to the US Great Lakes have been strongest from the Atlantic Provinces and Alberta, but Ontario has several sizeable residential modular housing producers including firms, such as Royal Homes, where strategic links with US-based residential builder-developers (e.g. the English Village development in Detroit) have been created.

The Canadian industry, however, comprises single plant operations and is dependent on batch production of custom homes. Excellent knowledge-based design and engineering skills exist, but larger volume, multi-plant operations do not exist in Canada that can compare with, for example, All American Homes in the US.

Imports of HUD Code manufactured housing (CSA Z240) serve Ontario's domestic market, but no domestic capacity exists within Ontario. Imported supplies are dominated by large national US-based firms, such as Champion Homes and Fleetwood. Except as a branch-plant supply base for US-based firms, Ontario is not considered to have significant market potential in HUD code housing compared with panelized and residential modular (CSA A 277) factory-built homes.

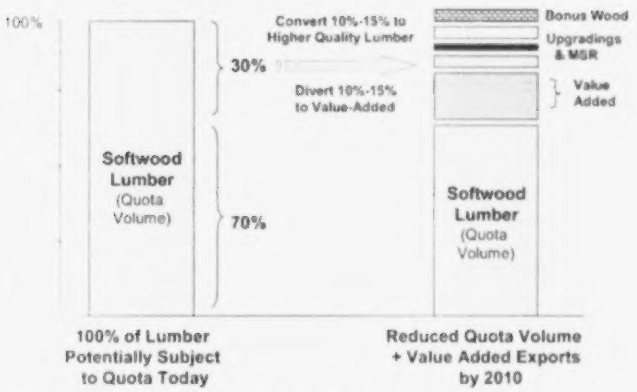
Although growth in primary and value-added wood product exports to the US factory-built industry remains as the #1 longer term growth option in this sub-sector for Ontario, panelized components and pre-cut homes rank as a good #2 prospect. Modular housing ranks as #3 but, given the right policy actions domestically, also has prospects for sustainable longer term growth through technology leadership. This is unlikely, however, to grow out of the wood products industry itself.

Rankings Between Sub-Sectors
How do the three sub-sectors compare for growth opportunities? In our view, Group A, structural building products, present the highest immediate commercial priority for wood products manufacturing development within Ontario. Group C, factory-built structures, also has a significant ranking and, over the longer term, could even supercede Group A in terms of earnings growth and export potential. Group B products, comprising wood windows, doors and other millwork, will continue to be a significant value-added manufacturing and export activity within Ontario, but is not likely to compare in overall significance with Group A or Group C in terms of growth potential for the province's wood products industry.

Policy Implications
Key policy issues are raised by the market opportunities identified in this report. Among the most immediate and economically significant are the implications and impacts on Ontario's sawmilling industry of possible future softwood lumber quotas under a future "SLA II" .

Chart 5

SLA II Can Force Positive Changes in Ontario Sawmills and Value-Added



Woodbridge Associates

Assumes constant softwood harvest

If the Ontario sawmilling industry is able to react affirmatively to a new quota environment and invest in a product upgrading, there could be a 'win-win' outcome. Up to 15% of lumber currently exported to the US eventually could be upgraded to products that, after further processing in Ontario, could be exported quota and duty free (Chart 5).

A further 15% could be diverted to value-added markets within the province and then exported in further processed form to export markets, including the US Great Lakes. While the latter would most likely be subject to quota if SLA II comes about, the Ontario industry would still have a net gain through its ability to sell higher grade products in a very tough marketplace.

Innovation, Technology and Cost Structures

To achieve this significantly increased emphasis on value-added manufacturing, the province of Ontario, through ministries such as Natural Resources (MNR) and Economic Development and Trade, need to establish the forest products manufacturing sector as a priority vehicle for profitable economic growth.

Potential linkages between the wood products industry and Ontario's construction industry are very relevant to this goal, and should be considered as a prospective initiative under other non-forest-sector competitiveness enhancing programs, such as *'Keeping Ontario Industries Competitive in the Global Marketplace*[8] which looks at the construction industry.

Consolidation of the wood products industry, which already is substantial in Ontario, is continuing to taking place in response to very tough global competitive conditions. The existence of fewer but more globally competitive national and international integrated manufacturing firms, with strong forward links into distribution, can work very well for Ontario.

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[8] See www.ontariocanada.com News Release, *'Eves Government Establishes Construction Industry Advisory Council to Increase Competitiveness and Help Create Jobs'*, Toronto, August 28, 2003

But these firms would have to be global leaders in technology and new product development – not just low cost commodity producers.

We have ten recommendations. Additional details are provided later in this volume (see 'Recommendations').

Recommendations

#1 Make the Phase I and II reports widely available to manufacturers.

# 2 Follow this up with other initiatives to communicate the market survey results.

#3 Encourage Ontario's industry leaders to take action and develop a formal vision for the sector. Notably, to develop the competitive leverage potential that exists.

#4 Ensure continuity of this process beyond 2003-04. LLT could play a key role.

#5 Initiate marketing research and trade development for eastern SPF lumber, notably technical support and promoting the attributes of Ontario's black spruce.

#6 Build a better data base of activities in Ontario's value-added sector.

#7 Assess investment risks and CAPEX needs in the CEOs' vision action plan.

#8 Involve economic development agencies and local communities.

#9 Give high priority to skills training and related needs.

#10 Link the CEOs' vision document and action plan to current initiatives already in process, such as the *'Ontario Forest Accord'* and *'Room to Grow'*.

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Purpose of the Report

This is one of four reports that are part of Phase II an overall study of value-added export market potential being carried out by the consultants for the Ontario wood products manufacturing industry and wood product users on behalf of the Government of Ontario's Living Legacy Trust.

Phase I Global Competitiveness Benchmarking

Phase 1 established a data base and examined global benchmarks of competitiveness. A copy of the Phase 1 reports carried out by Jaakko Poyry[9] and published in 2001 is provided on the Trust's website.

Phase II Market Study of Three Product Groups

Phase II presents the findings of a detailed market study of three specific product groups identified in the Phase I conclusions. These are as follows:

Group A: Structural Engineered Wood & Building Components

Group B: Millwork (Windows, Doors and Other Millwork)

Group C: Factory-Built Structures (Manufactured Housing, Panelized, Pre-Cut and Modular Homes)

The principal goal of Phase II is to provide a market research study. As a follow-up to the 2001 Phase 1 study, our focus is on a specific market area – namely, the U.S. Great Lakes market region. Our task was to identify market opportunities within each of the three specified statistical product groups. It is intended that the report will link these to the potential for increased trade between Ontario and the United States.

Public Workshops

Early communication of the Phase II results was requested by the Trust's Value-Added Committee for this project. Accordingly, two open-session industry workshops were held in June 2003 where preliminary findings were presented and discussed. The first workshop was held on June 17th at Thunder Bay, Ontario, and the second on June 24th at Barrie, Ontario. Both workshops were attended by representatives from Ontario's wood products and value-added manufacturing sector.

Feedback from the workshops was included in the subsequent analyses. In addition, interviews and field work in Ontario and the US Great Lakes market area were conducted during the course of the study.

U.S. Great Lakes Market Region Definition

The U.S. Great Lakes region comprises the eight states – Michigan, Ohio, Wisconsin, New York, Pennsylvania, Illinois, Indiana and Minnesota.

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[9] Jaakko Poyry *'Assessment of the Status and Future Opportunities of Ontario's Solid Wood Value-Added Sector.'* Research Report (26 June 2001) and other volumes.

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The Ontario Wood Products Industry

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The Ontario Wood Products Industry

This section provides a statistical profile of the Ontario value-added wood products sector, and its role within the total output of the province's forest products manufacturing industry. Production, exports, employment and the consolidation of sawmilling capacity are reviewed.

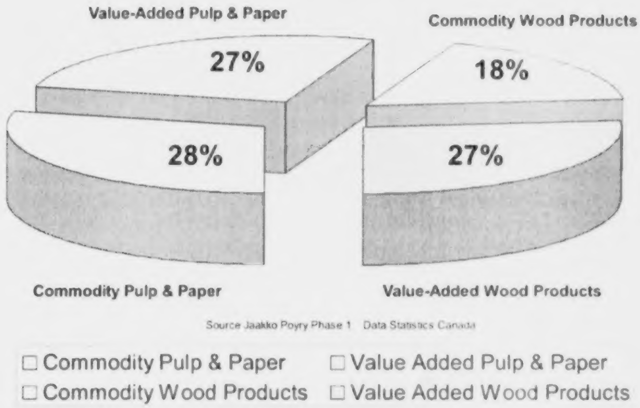
Value of Output

In the 2001 Phase I report, Jaakko Poyry noted that the value of forest products manufactured in Ontario was over C$15 billion in 1997[10]. The largest segment of the industry was pulp and paper, accounting for about 55% of shipments value (Chart 6). The balance of 45% was wood products, including furniture.

Chart 6

Ontario Forest Products Industry
Value of Shipments 1997

Total C$15.3 Billion



Source Jaakko Poyry Phase 1 Data Statistics Canada

Within the pulp and paper sector, shipments of commodity grades (comprising pulp, newsprint and other lower valued papers) accounted for about half of shipments from pulp and paper mills and plants in Ontario. Value-added papers and paperboards, including corrugated boxes, folding carton and other packaging grades as well as consumer grades, such as tissues, along with fine papers accounted for the other half.

In the wood products industry, value-added shipments accounted for 60% of total shipments if wood furniture is included or about 40% of shipments value of the wood products sector if they are excluded.

The main products manufactured by the primary wood products industry are softwood lumber, oriented strand board (OSB) and medium density fiberboards (Chart 7). In addition, the primary sector is a producer of hardwood lumber (but a net importer of this product), treated wood, hardwood veneers & plywood and particleboard.

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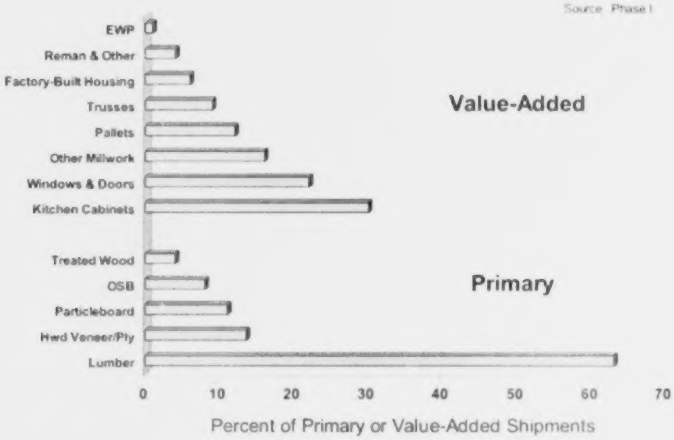
[10] Jaakko Poyry 'Assessment of the Status and Future Opportunities of Ontario's Solid Wood Value-Added Sector Research Report (26 June 2001) and other volumes.

More recent data show that there has been a significant increase in the shipments value and proportion of OSB, EWPs and building products.

Chart 7

Ontario's Wood Product Shipments 1997



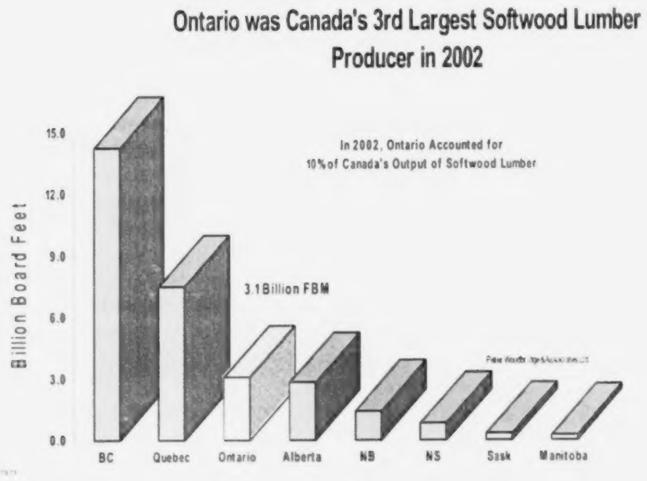
Source Phase I

Value-added wood products manufactured in Ontario include a significant remanufacturing sector, kitchen and bathroom cabinets, wood windows and doors, mouldings, other millwork, wood pallets and crates, wood trusses and other building components, structural systems, engineered wood products, panelized and modular factory-built housing.

The industry produces I-Joists, engineered fingerjoint lumber, laminated beams and a variety of non-structural engineered wood products, such as edge-glued panels. Machine stress rated (MSR) lumber production and engineered fingerjoint wood manufacturing in the province is comparatively low.

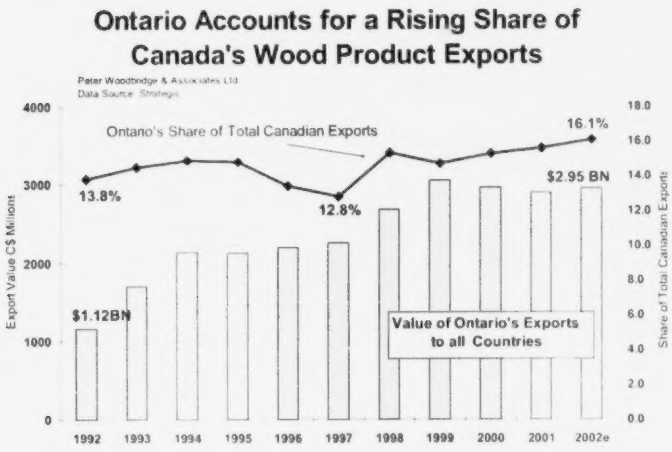
Ontario ranks as #3 within Canada as a producer of softwood lumber. Chart 8 shows Ontario's position behind BC and Quebec, and just ahead of Alberta which grew rapidly in significance during the 1990's.

Chart 8


Ontario was Canada's 3rd Largest Softwood Lumber Producer in 2002

Over the past decade, the size of Ontario's wood products industry has grown substantially. Based on the province's export market performance in all wood products aggregated, the industry in Ontario has improved its competitive performance compared with the rest of Canada.

Chart 9


Ontario Accounts for a Rising Share of Canada's Wood Product Exports

Peter Woodbridge & Associates Ltd
Data Source: Strategis

Chart 9 provides an overall summary of the trends since 1992. Compared with 1992, when Ontario exported about $1.1 Billion of wood products to all countries, by 1999 this had risen to nearly $3.1 Billion.

The chart shows that even though low commodity wood product prices have contributed to a reduction in the overall value of the province's export shipments since 1999, the province's share of total Canadian exports has continued to rise. In 2002, we estimate that Ontario held a 16.1% share of total Canadian exports to all countries compared with 12.8% in 1997 and 13.8% in 1992.

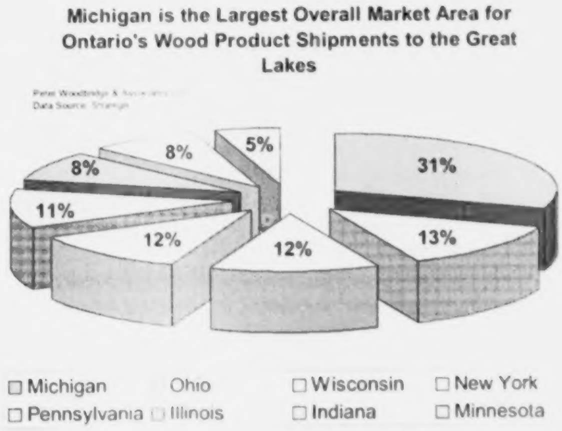
Most of the increased export shipments have been to the United States. In addition, with increasingly buoyant housing markets within Canada, and particularly in Ontario, it is clear that demand for the province's wood products has been increasing.

Ontario's Wood Product Exports

In 2002, 96% by value of Ontario's wood product exports (excluding wood furniture) were shipped to the United States, with a total value of over C$2.8 Billion. Less than 4% were sold overseas. Like many areas of Canada, Ontario has increased its market dependence on the US over the past decade.

Sixty percent by value of Ontario's wood products exports to the US in 2002 were shipped to the Great Lakes states. The composition of export shipments by state within the Great Lakes region is summarized in Chart 10.

Chart 10



Michigan is the Largest Overall Market Area for Ontario's Wood Product Shipments to the Great Lakes

Peter Woodbridge & Associates
Data Source: Strategis

The chart shows that Michigan is by far the largest single market area for Ontario's wood product exports to the region. In 2002, Michigan accounted for an estimated 31% of the province's exports by value to the region. The next largest market was Ohio, accounting for an estimated 13% of the total, followed by Wisconsin (12%), New York (12%), Pennsylvania (11%), Illinois (8%), Indiana (8%) and Minnesota (5%)

Softwood Lumber Shipment Volumes

Fluctuations in product prices and changes in exchange rates can disguise export market performance when this is expressed in value terms. Table 4 provides a summary of Ontario's softwood lumber shipments by volume to the US Great Lakes states for the period 2000 to 2002.

Table 4
Ontario's Lumber Shipments to US Great Lakes States, by Volume

Million fbm

State / Region	2000	2001	2002	2002 Rank
Michigan	385.3	370.7	402.3	#1
Ohio	102.6	123.2	134.8	#3
Wisconsin	116.7	144.1	182.4	#2
New York	30.5	41.4	34.7	#8
Pennsylvania	64.6	73.6	59.8	#7
Illinois	127.3	116.5	110.3	#4
Indiana	92.4	94.2	100.0	#5
Minnesota	80.9	78.9	67.1	#6
Great Lakes	**1000.3**	**1042.6**	**1091.4**	**n.a.**
U.S. Total	1784.1	1871.6	1986.7	n.a.
Great Lakes % of U.S. Total	**56.1%**	**55.7%**	**54.9%**	**n.a.**

Peter Woodbridge & Associates Ltd. SFPA Distribution of Canadian Lumber Shipments 2002
n.a. = not applicable

In 2002, Ontario shipped nearly two billion fbm[11] of softwood lumber to the United States. Close to 55% of this volume was shipped to the US Great Lake states, but subsequently, some may have been shipped beyond the region.

The Great Lakes region clearly is Ontario's most important market region within the US. Shipments to other regions increased slightly over the period. Table 4 shows that the ranking of importance of the Great Lakes states for Ontario's lumber shipments by volume differs slightly from the shipments value data in Chart 10, but conveys essentially the same conclusions.

In particular, New York has been of less significance as a destination for Ontario's softwood lumber shipments than for value-added wood products. Quebec is a major supplier to New York.

US Softwood Lumber Duty and Recent Market Impacts

In May 2002, a 27% combined average duty was imposed by the United States on imports of Canadian softwood lumber from most sources. Additionally, sharp fluctuations in lumber and other commodity prices (notably OSB in Summer 2003), along with exchange rate fluctuations and mill production cutbacks, have had a sharp negative impact on the value of Ontario's exports to the U.S.

This impact is shown in the sharp drop in Q1 and Q2 2003 shipments value in Chart 11. For the first five months of 2003, the value of Ontario's shipments of all wood products combined dropped by 19% to C$2.3 Billion on a seasonally adjusted annualized rate. A short term upward spike in lumber and OSB prices later in the year improved market prices, but the rising Canadian dollar in US funds reduced or eliminated much of the gain for Canadian producers. By November 2003, the Canadian dollar in U.S. funds was 20% higher than at the start of the year.

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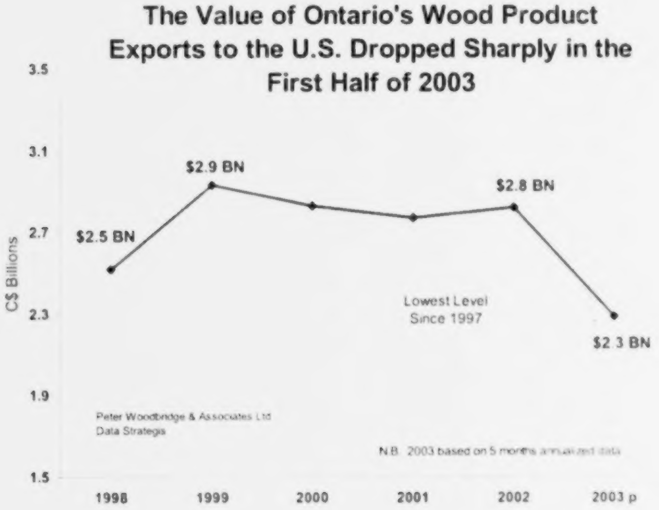
[11] Industry Canada data showed that Ontario shipped 2.2 billion fbm of softwood lumber to the U.S. in 2002. www.dfait-maeci.gc.ca/eicb/softwood/lumberstats-en.asp

Chart 11



The Value of Ontario's Wood Product Exports to the U.S. Dropped Sharply in the First Half of 2003

Peter Woodbridge & Associates Ltd
Data Strategis

N.B. 2003 based on 5 months annualized data

Between 1999 and 2002, the value of Ontario's wood product exports to the United States remained within the C$2.7 Billion to C$2.9 Billion range. This is felt to be more representative of the sector's normal export earnings, prior to the foreign exchange impact and before mill closures in Ontario.

Consolidation in Ontario's Integrated Wood Products Industry

Over the past decade, many of Ontario's independent primary producers have disappeared. Today, the province's 111 softwood sawmills produce over 3 billion board feet of lumber. There is considerable diversity in size and production capability. Around 70 small single-location and specialty mills produce only 2% of the total output (Chart 12).

On the other end of the spectrum, four large-scale sawmills (over 150 million fbm annual output) produce 25% of the province's softwood lumber output. The next 12 mills produce a further 46% of the total output.

Four firms dominate the Ontario lumber industry and there are signs that consolidation will continue. In mid-2003, Domtar and Tembec announced a joint-venture merger of their respective wood products manufacturing, allied forestry and marketing operations, affecting several sawmills and woods operations in Ontario. The proposed joint-venture would have further concentrated the ownership of sawmills located within the province (Chart 13), but it was cancelled by mutual agreement in November 2003[12].

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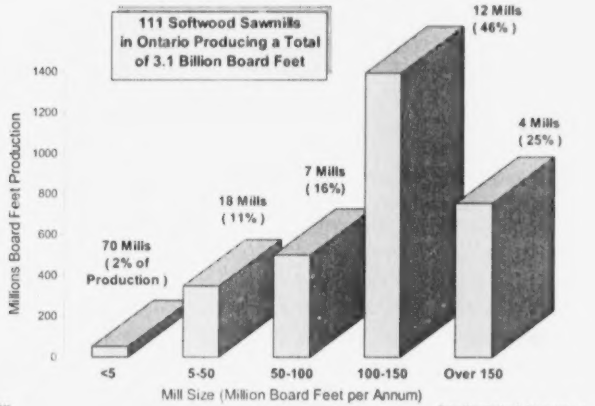
[12] "Tembec and Domtar End Discussions on Creation of Forest Products Joint Venture." Canada Newswire, November 25 2003

Chart 12

Ontario Softwood Sawmills
By Mill Size and Output 2002



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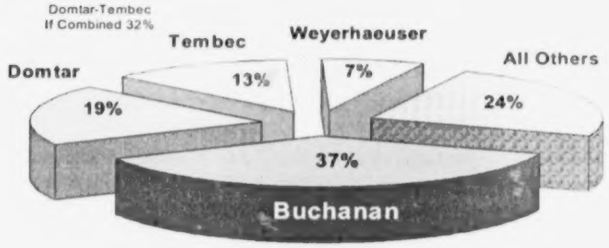
Peter Woodbridge & Associates Ltd

Chart 13

Ontario Softwood Lumber Production 2002



Tembec includes proposed acquisition of Weyerhaeuser's Chapleau, Ontario sawmill in October 2003

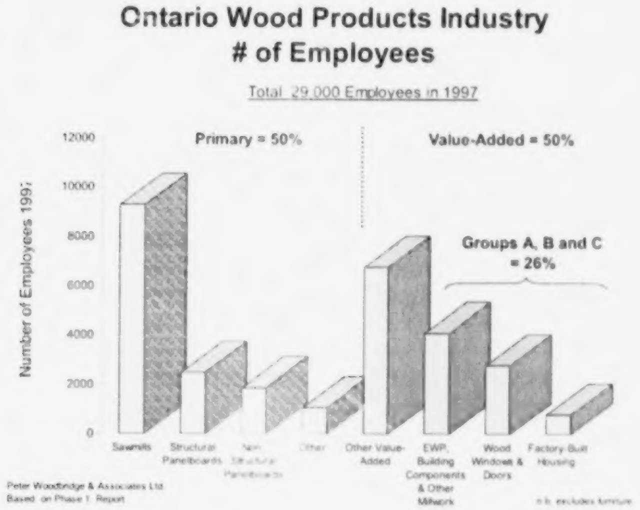
Ontario Total 3.1 Million FBM (111 Mills)
65% of Production from 16 Mills each with 100 Million FBM Output
77% of Production from 23 Mills each with 50 Million FBM Output

#2885-333 revised

The largest single producer is Buchanan, accounting for about 37% by volume of Ontario's lumber output in 2002. The proposed (now cancelled) Domtar-Tembec wood product operations merger was announced in 2003. Had it proceeded, the operations of the merged firm would have accounted for 32% of Ontario's 2002 lumber production on an equivalent basis. This includes the currently proposed acquisition by Tembec of Weyerhaeuser's Chapleau sawmill[13]. Weyerhaeuser is the fourth largest producer with about 7% of the total.

Bowater and others are included in 'All Others', representing 25% of Ontario's lumber ouput in 2002. In many cases (e.g. Domtar, Bowater), the primary purpose of the sawmills is to provide log-value recovery through lumber production, but this is secondary to the supply of chips to integrated pulp and paper operations. In other cases, chip supply from independent sawmillers, such as Buchanan, is vital to the viability of the pulp and paper sector, but these mills are focused on lumber production as their main business.

Chart 14



Peter Woodbridge & Associates Ltd
Based on Phase 1 Report

The dominance of Ontario's pulp and paper sector within the overall forest economy is reflected in the type of milling equipment found in many older vintage sawmills. Whole log chipping in woodrooms has comparatively recently been supplanted by growth in softwood lumber capacity. Lumber recovery factors are still comparatively low in many cases, notably where a series of upgradings of older vintage log handling and milling technology has taken place.

Improved value-recovery is possible, even with province's smaller-sized logs. Increased CAPEX has occurred selectively within the province's lumber sector as larger integrated firms have optimized processing facilities to match better with available timber supplies and market opportunities. Generally, however, this has been a slow and inconsistent process within Ontario.

Volume 4 provides details of recent CAPEX history in wood products, and shows that most of the CAPEX growth has taken place in relation to hardwoods, notably in aspen (OSB and TimberStrand) along with MDF.

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[13] Tembec reached agreement-in-principle to acquire Weyerhaeuser's Chapleau sawmill assets in October 2003

Employment in the Ontario Wood Products Industry

The Phase I report noted that direct employment by the Ontario forest products industry totaled over 29,000 persons in 1997[14]. This excludes employment in the furniture industry. Roughly 50% of the total were employed in primary wood product manufacturing activities and the other half in a variety of value-added processing jobs (Chart 14).

The chart also shows that employment in the three groups of products that are the focus of this report was about 26% of total, or about 7,625 jobs. The largest concentration of employment (14%) was in structural engineered wood, building components and the 'other millwork' category (close to 4,100 jobs).

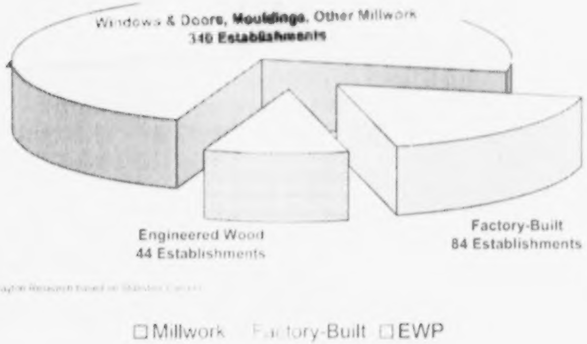
The wood windows and doors sub-sector accounted for a further 2,770 jobs (9%-10%) and the factory-built sector roughly 2% to 3%. The latter appears to be understated because some pre-cut homes employees are included under 'other value-added'.

Ontario Value-Added Sectors

Statistics Canada notes that, in 2001, there were 468 establishments manufacturing the products included in the three groups that are the focus of this report.

Chart 15

Ontario Value-Added Industry 2001
# Establishments Manufacturing Selected Products



Clayton Research based on Statistics Canada

Of these, 44 produced engineered wood products, 340 manufactured wood windows, doors and other millwork, while 84 were producers of pre-cut homes and factory-built structures (Chart 15).

The chart provides only a partial picture. It does not indicate the relative importance of these three manufacturing groups. EWP plants, for example, tend to be large scale. Some, such as the new TimberStrand LSL plant in Kenora, ON are state-of-the-art and among the largest in the world. In other instances, many of Ontario's millwork plants are very small scale. Further discussion of the province's competitive position in these products can be found in Sections A, B and C.

---

[14] The Ontario Forest Industries Association (OFIA) states that the forest industry directly or indirectly employs approximately 180,000 people, or 1 in 31 employed Ontarians.

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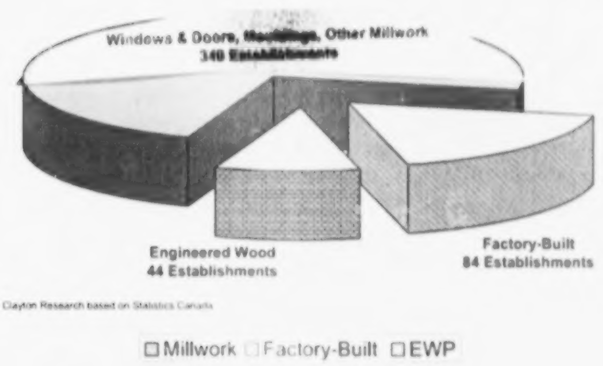

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How Does Ontario Compare with the Great Lakes in Value-Added Employment?

Wood products employment in the US Great Lakes region in 1997 (Census data) was over 143,000 persons. Of this, 29% was in primary wood products and 71% was in value-added activities. More detailed comparisons are provided in the next section and the implications are discussed in the 'Conclusions and Recommendations.

Global Benchmarks

Various assessments, including the Phase I report, acknowledge that Ontario's development of its value-added processing sectors is well ahead of all other areas of Canada, except Quebec (which has a similar level of value-added development). In comparing Ontario with benchmark regions of the world, Jaakko Poyry points out in the Phase I Report that most Canadian provinces, including Ontario, are still very dependent on lower value commodity products.

Corporate Earnings, Profitability and CAPEX

Price Waterhouse carried out a study[15] in 1999 which was based on a sample of public quoted firms representing roughly half of Ontario's sales of wood products and paper and allied products. The study shows that, despite significant levels of annual capital expenditures, the industry's underlying costs and debt levels were high, company earnings were low and return on capital was low on average.

The study also showed that return on capital employed was highest in Ontario's lumber and panels sub-sectors, and lowest in market pulp and publication papers (newsprint).

Transportation Networks in Northern Ontario

One of the features of the Ontario forest industry central to this report is the commercial relationships that exist between northern Ontario and southern Ontario. In particular, comparatively few of the products manufactured in northern Ontario are further processed in southern Ontario. Many are shipped directly to export markets or the Toronto market.

Most value-added wood product processing facilities within Ontario are heavily concentrated in the southern part of the province where plants are close to major international road and rail transportation networks and US markets. Many of these plants buy their raw materials and semi-processed materials directly or indirectly from out of the province.

In contrast to the relative ease of access to markets from locations in southern Ontario, value-added plants located in northern Ontario frequently have to overcome significant infrastructural, weather-related and other obstacles. In order to remain economic, they have to mirror the success of the primary wood products industry (which mainly is located in northern Ontario) and produce large volumes of comparatively standardized products and ship these via lower cost bulk transportation facilities.

Whereas value-added plants in southern Ontario are able to respond quickly and efficiently to custom orders from the US and can operate successfully on a batch production basis (e.g. truss manufacturers), the economics of value-added manufacturing in northern Ontario are fundamentally different.

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[15] *The Primary Forest Products Industry in Ontario. 1998* Report Tables (Sept 1999) Price Waterhouse

The Great Lakes Market Region

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The Great Lakes Market Region

This section provides a brief summary of the main characteristics of the Great Lakes market, from the point of view of increased shipments of wood products from mills and value-added plants in Ontario. More detailed state analyses are available as a market research tool for Ontario manufacturers. They are provided in Volumes 2 and 3 of the report.

Market Research Area

The US Great Lakes region comprises eight contiguous states that geographically form natural export markets for Ontario. The province has borders with the states of New York, Michigan and Minnesota and is located in close proximity to the remaining states in the region – namely, Pennsylvania, Ohio, Indiana, Illinois and Wisconsin.

Chart 16

U.S. Great Lakes Region

- Target Market Area

Minnesota
Wisconsin
Michigan
New York
Pennsylvania
Illinois
Indiana
Ohio

Peter Woodbridge & Associates and Clayton Research

The region is well developed economically. With an estimated population of about 83 million in 2003, it accounted for about 29% of the total population of the United States.

Population of the Region

Population growth in the region is slower than the average for the United States overall, ranging from a high of 0.7% in Minnesota from 2001-2002 to a low of 0.3% in Pennsylvania and Ohio, compared with a national average of 1.1%.

In terms of population distribution, the largest population concentration in the region is in New York State (19 million in July 2002) while the lowest is in Minnesota (4.9 million). Table 5 provides the details.

Table 5

Population Estimates for U.S. Great Lakes Region

State	Population '000 July 2002	Population Growth 02/01
New York	18,976	0.4
Illinois	12,419	0.6
Pennsylvania	12,281	0.3
Ohio	11,353	0.3
Michigan	9,938	0.4
Indiana	6,081	0.5
Wisconsin	5,364	0.7
Minnesota	4,920	0.7
U.S Great Lakes Region	81,332	0.4

Source: U.S Census Bureau

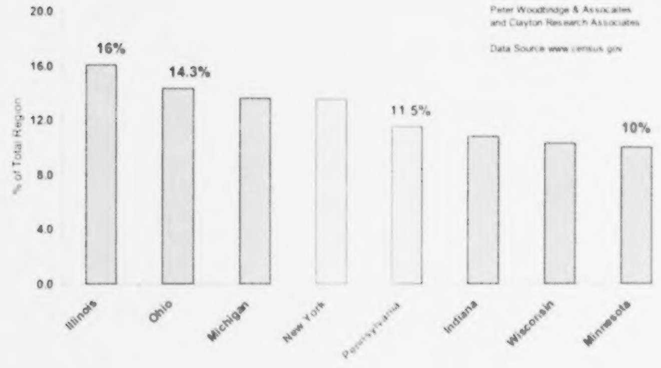
Residential New Construction

Illinois (#2 in population) accounted for over 16% of residential permitting activity during 2002. New York and Pennsylvania, which also have large populations, accounted for a proportionally lower share of overall new residential construction activity.

New residential housing activity in the Midwest states, however, is comparatively strong on the basis of a comparison of population. Thus, per thousand population, it is clear that new housing activity in Michigan (Ontario's #1 market for wood products) has been growing at a faster rate than in, for example, New York and Pennsylvania. Overall, the region has a higher percentage (74% v. 72%) of single family starts in its total mix than the national average.

Chart 17

U.S. Great Lakes Region
Distribution of Building Permits, by State 2002



Peter Woodbridge & Associates
and Clayton Research Associates

Data Source www.census.gov

Manufactured Housing

The US Great Lakes region is a major consumer of factory-built housing. It is also a major centre for factory-built housing plants which supply the Midwest and Northeast. Some of the largest manufactured homes (HUD Code) and residential modular producers in the industry are located in the region, notably around Elkhart Valley.

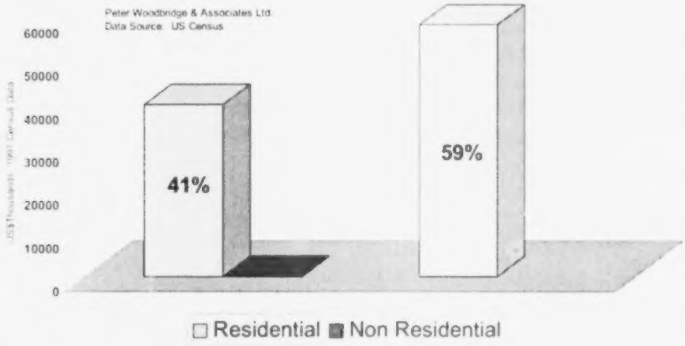
Leading producers include All American, Champion (and Genesis Homes), Fleetwood, Ritz Craft (which has the largest per square foot area of manufacturing capacity under a single roof), Crest and many others. These firms frequently enjoy the benefits of large industrial clustering complexes, which helps drive down their unit costs of production.

Non-Residential Construction Markets

The US Great Lakes region is an important consideration for Ontario's wood product manufacturers and value-added processors also from the perspective of the large non-residential markets that exist.

Chart 18

U.S. Great Lakes Region Construction Industry Expenditures



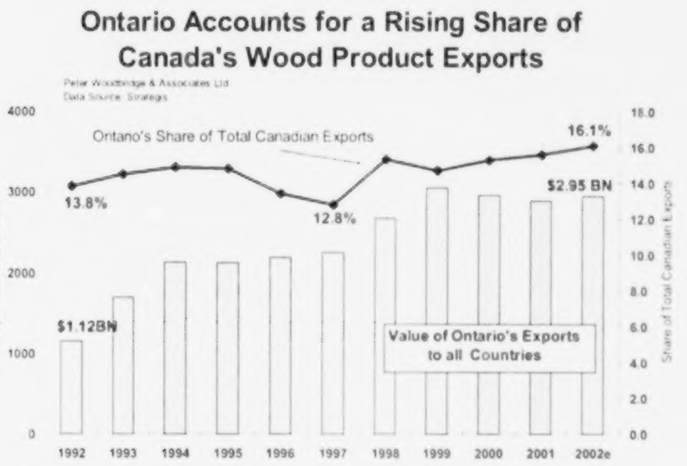
Non-residential markets for wood trusses, and structural engineered beams are particularly significant in the region. In addition, the demand for panelized components and factory-built portable buildings (notably rental fleet structures) is buoyant. A wide range of millwork items is consumed.

Chart 18 shows that even though residential housing markets in the Great Lakes region are substantial, they are exceeded overall by non-residential markets, which are large consumers of non-wood building materials. Remodelling markets (see Volume 4) in the U.S. Great Lakes states are substantial consumers of wood products.

Ontario's Existing Shipments to the Great Lakes

Over the past decade, the size of Ontario's wood products industry has grown substantially. Based on the province's export market performance in all wood products aggregated, the industry in Ontario has improved its competitive performance compared with the rest of Canada.

Chart 19



Ontario Accounts for a Rising Share of Canada's Wood Product Exports

Peter Woodbridge & Associates Ltd
Data Source: Strategis

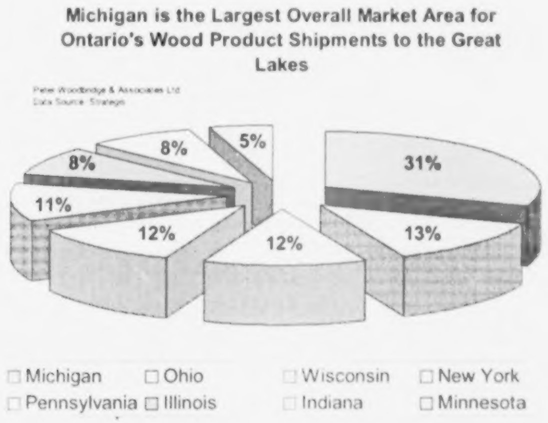
Chart 19 provides an overall summary of the trends. Compared with 1992, when Ontario exported about $1.1 Billion of wood products to all countries, by 1999 this had risen to nearly $3.1 Billion.

The chart shows that even though low commodity wood product prices have contributed to a reduction in the overall value of the province's export shipments since 1999, the province's share of total Canadian exports has continued to rise. In 2002, we estimate that Ontario held a 16.1% share of total Canadian exports to all countries compared with 12.8% in 1997 and 13.8% in 1992.

Most of the increased export shipments have been to the United States. In addition, with increasingly buoyant housing markets within Canada, and particularly in Ontario, it is clear that demand for the province's wood products has been exceptional. Most primary mills report high rates of capacity utilization in softwood lumber, despite the imposition of a 27% tariff by the United States in May 2002.

Analyses prepared by DFAIT[16] provide data on Ontario's volume shipments to the U.S. since the tariff was imposed.

Chart 20



Michigan is the Largest Overall Market Area for Ontario's Wood Product Shipments to the Great Lakes

Peter Woodbridge & Associates Ltd
Data Source: Strategis

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[16] www.strategis.gc.ca Export and Imports Controls. Volume and Value of Exports to the U.S. January 17th 2002

Ontario's principal export markets in the U.S. Great Lakes region continue to generate increased demand for the province's wood products. The eight states in the Great Lakes region accounted for an estimated 60% of overall export shipments by value to the United States in 2002. The composition by state within the Great Lakes region is summarized in Chart 20.

The chart shows that Michigan is by far the largest single market area for Ontario's wood product exports to the region. In 2002, Michigan accounted for an estimated 31% of the province's exports by value to the region. The next largest market was Ohio, accounting for an estimated 13% of the total, followed by Wisconsin (12%), New York (12%), Pennsylvania (11%), Illinois (8%), Indiana (8%) and Minnesota (5%).

Primary Wood Product Markets in the Great Lakes

Why are shipments of commodity grade wood products, such as framing lumber, of importance in a study of value-added wood product markets and competitiveness? There is one over-riding reason in our view. In value-added structural markets, there is a high rate of substitution of engineered products for traditional solid wood products. Thus, I-Joists and open-web joists displace 2x10 solid lumber in floor systems, 2x4 stud fingerjoint lumber displaces 2x4 natural studs, engineered posts displace banks of studs nailed together by framers on site for Parallam, LVL and TimberStrand beam support.

Further, in medium length beams such as 2x10's used in garages, LVL and Parallam have been displacing the dimension product in many regions. The reverse is true in many cases where door and window headers, previously made from LVL or TimberStrand, have been displaced by solid lumber with an OSB spacer fabricated on site. This is due to increases in the relative prices of engineered products during the U.S. housing market boom of the past several years.

> Ontario's solid wood commodity product manufacturers should be concerned about the potential loss of their markets in the U.S Great Lakes region as engineered wood and other value-added products capture market share from traditional structural products.

As a result, many of Ontario's existing sawmills that are selling large volumes of E-SPF studs and 2x4 random length today into the U.S. market are likely to experience dramatically changed fortunes if current rates of displacement continue.

In particular, many end-users of Ontario-sourced dimension lumber will continue to meet increased competition from engineered wood and building components.

Value-Added Wood Product Markets in the Great Lakes

Ontario's value-added wood product exports to the U.S. Great Lakes region also have increased substantially. The in-depth analysis of value-added wood product markets for the three chosen product groupings clearly is the focus of the market research involved in this report.

Centres of Manufacturing Excellence

The centres of excellence in each of the three product groupings differ. Moreover, whereas some states have, for example, substantial manufacturing capacity in factory-built housing, others are more significant in, say, wood windows and doors production.

Chart 21

Millwork Output in U.S. Great Lakes

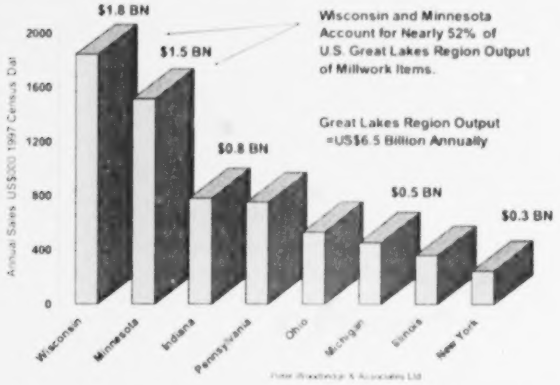


Chart 21 illustrates the situation for millwork output in the region. Of the eight states comprising the U.S. Great Lakes region, Wisconsin and Minnesota account for over half (52%) of the region's output, based on aggregate annual sales for all plants.

Even though New York has many wood window and door manufacturers, most of these are small scale and, on a national scale of comparison, fairly inefficient 'mom and pop' operations. However, some are hardwood lumber-based high-end windows producers.

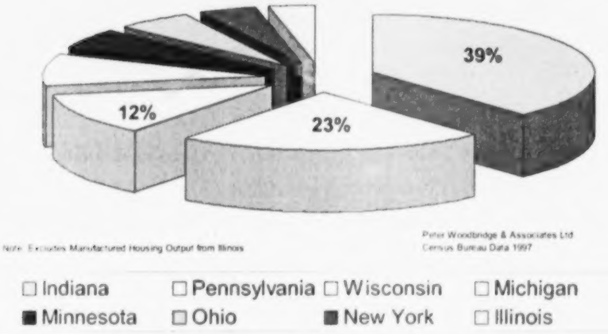
Larger scale plants with lower unit costs are located in Wisconsin, Minnesota and elsewhere. Ontario has parallel plants and many of these most likely are competitive with them (our market research analyses will aim to find this out, and to identify the drivers of regional competitiveness). Importantly, these examples provide a clue as to the two broad strategic options that are available to manufacturers in Ontario that wish to increase their share of these export markets.

Conceptually, the two options available to Ontario's value-added wood product manufacturers are to compete directly against larger scale, lower unit cost plants that generally aim their products at low to medium price points or to target the winning of market share from smaller scale, usually higher unit cost, often specialty plants, that serve higher price points.

These two broad options also are valid for Ontario's producers of factory-built housing. In major producing states such as Indiana and Pennsylvania (Chart 22), the industry is dominated by large scale producers, including All American, Champion (including Genesis Homes), Fleetwood, Crest, Excel, Penn Lyon, Avis America and Marco.

Chart 22

Factory-Built Housing Output in U.S Great Lakes



Note: Excludes Manufactured Housing Output from Illinois

Peter Woodbridge & Associates Ltd
Census Bureau Data 1997

Product Succession and Substitution Trends in the Region

Ontario's millwork products are an example of the types of product succession and substitution trends taking place in the region. Within millwork markets in the Great Lakes region, high rates of product substitution are widespread. For internal mouldings and high grade appearance finishing work, medium density fibreboard (MDF) has displaced solid wood in many instances. However, not all Canadian MDF mills are prepared to alter their production programs to cater for the specialty mouldings market.

Correspondingly, remanufacturing based on Canadian MDF supply within the Great Lakes states has taken place over the past five years in particular. Some of the MDF is from U.S. origin mills, but Canadian mills also supply these remanners. In clears and #1 industrial grade lumber formerly used in the wood windows and wood doors market, several technological changes have led to dramatic shifts in consumption patterns at the expense of solid wood. In addition, high quality low cost mouldings have become available from Chile, Brazil and Argentina.

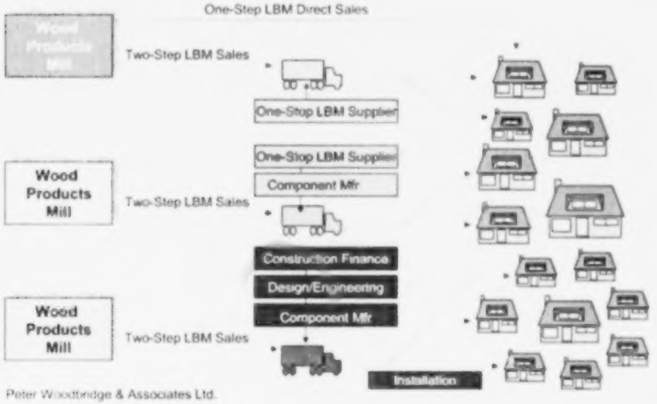
Hardwood lumber used by the millwork industries of the U.S. Great Lakes has experienced a mix of market changes comprising (a) better prices and greater recognition of Canadian hardwoods, especially in high end market applications, and (b) substitution at the lower end by cheaper imports.

Evolving Distribution Patterns into the U.S. Great Lakes

Throughout North America, dramatic changes have been taking place in the lumber and building materials (LBM) supply chain over the past decade. The pace of the changes has accelerated remarkably since the mid-1990's as one-step marketing by Canadian mills to 'whole package' distributors has displaced two-step marketing.

Chart 23

Developing a New Paradigm.....Who *Best* Can Respond?
Retail Distributors & Pro-Dealers are Well-Positioned to Provide
One-Stop Outsourcing for Builders. Some are Tied to EWP Brand-Suppliers



Peter Woodbridge & Associates Ltd.

In addition, most larger-scale American distributors have taken on new roles as (a) value-added component manufacturers and (b) providers of value-added services, including truss design, engineering and/or project financing. Chart 23 illustrates these changes.

Chart 23 illustrates the observation that fully integrated Canadian wood product mills in general have not been as aggressive in responding to changing needs in U.S. construction markets (or for that matter Canadian construction markets) as American distributors have been in the US.

On the other hand, Canadian independent component plants, such as Ontario's truss manufacturers, along with I-Joist producers, have been very active in expanding their manufacturing facilities to serve rapidly growing markets throughout the United States. Much of this volume has been directed into the U.S. Great Lakes region, reducing the market share of operators of smaller scale, generally less-efficient Midwest plants.

Rapid growth in local demand for wood trusses and components has encouraged the growth of small scale plants to be developed in the Great Lakes region, but many of the larger plants are in Canada. Several national retailers and pro-dealers have built or acquired component plants to meet the rapidly growing demand for these products. Despite this, Canadian market share in the U.S. is believed to be increasing in products such as I-Joists[17].

Issues

The small scale of many American truss and panelization/component manufacturers (but not structural EWP producers, such as LVL, I-Joists or glulam) offers a potential competitive advantage over the longer term to Ontario's wood products industry through joint ventures and/or strategic alliances/partnerships.

Even with a continuation of current U.S. tariffs on softwood lumber (or a return to quotas under "SLA II"), the packaging of ready-to-assemble (RTA) components within Ontario for subsequent fabrication within large scale American-owned plants in the Great Lakes region appears likely to be financially feasible. Off-site fabrication of wall panels is a significant opportunity.

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[17] Testimony of Mr. Tom Denig, President and CEO at ITC Hearings on Investigation 332-445, Washington DC, December 5th 2002.

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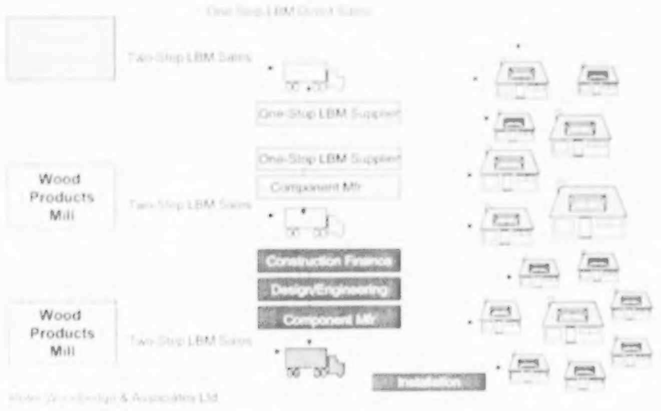

Note: Woodbridge & Associates Ltd

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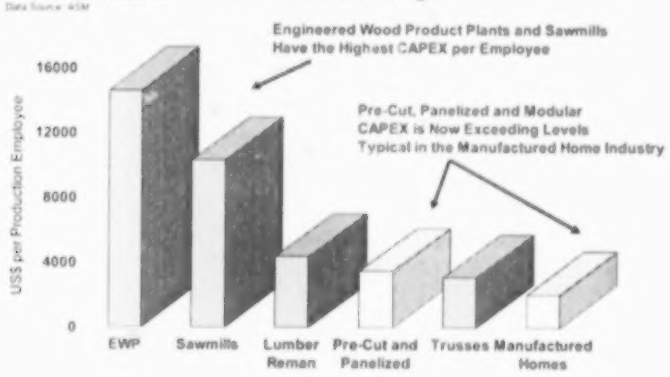
Capital Expenditure Benchmarks

These are a strong indicator of future competitiveness. We note from experience that technological leadership in the value-added wood products business is a strong advance indicator of sustainable competitiveness in this business.

Chart 24 shows that CAPEX per employee varies widely within the value-added wood products industry. The highest per employee CAPEX levels are found in engineered wood products, where technological leadership and market dominance comes at a price. Lowest levels are found in the very fragmented truss industry.

Chart 24.

Capital Spending (CAPEX) Per Employee
1997-2001 Average



Peter Woodbridge & Associates Ltd
Data Source: ASM

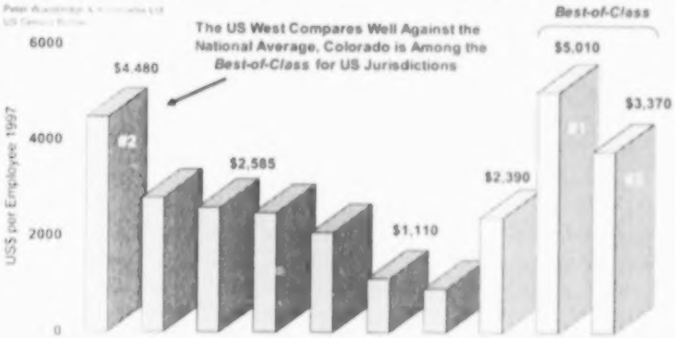
Engineered Wood Product Plants and Sawmills Have the Highest CAPEX per Employee

Pre-Cut, Panelized and Modular CAPEX is Now Exceeding Levels Typical in the Manufactured Home Industry

Chart 25 shows that for the whole of the U.S., plants in Colorado, Minnesota and Wisconsin are best-of-class performers in innovative approaches to productivity. They far exceed the national average. Correspondingly, Ontario producers seeking to break into regional markets supplied by these U.S. industry leaders have to prepare their market analyses thoroughly and think carefully before competing aggressively for market share.

Chart 25

Pre-Cut, Panelizers & Modular Plants:
Capital Spending per Employee



Peter Woodbridge & Associates Ltd
US Census Bureau

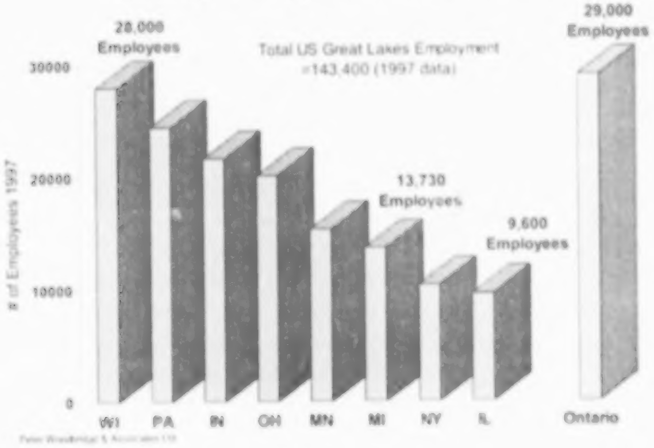
The US West Compares Well Against the National Average, Colorado is Among the *Best-of-Class* for US Jurisdictions

Value-Added Employment in the US Great Lakes

In comparison with individual states, Ontario is a sizeable employer when primary and value-added activities are combined. Chart 26 shows that other jurisdictions that are large employers include Wisconsin and Pennsylvania. Some of the states with comparatively low employment levels in this sector include Illinois and New York.

Chart 26

Wood Products Employment: Ontario's Industry is Large Scale v Great Lakes



However, over half of Ontario's forest products sector employment came from primary manufacturing activities in 1997. Chart 26 compares the scale of the province's primary wood products employment with that of each of the eight Great Lakes. It shows that, in these activities, Ontario with 29,000 employees was by far a larger employer in 1997 than any of the individual states.

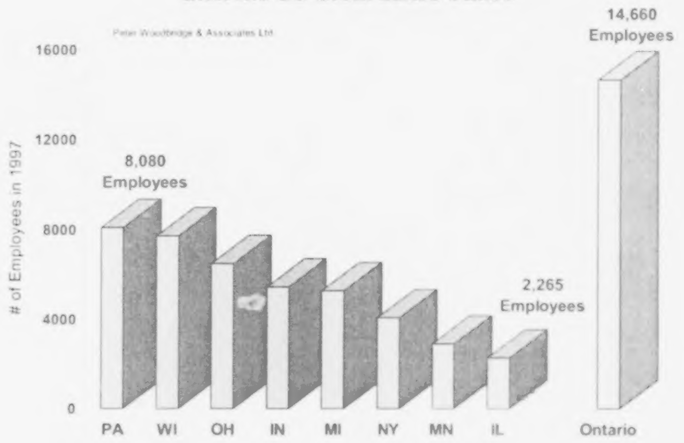
Wisconsin was the next largest employer in regional wood products production, with 28,000 employees in 1997. Other states such as Pennsylvania, Indiana and Ohio were comparable.

Michigan, which is Ontario's largest single market for wood products in the region had around 13,730 employees employed in the wood products industry in 1997. Its relative size to Ontario, in this respect, reflects the close working and trading relationship between the two.

New York, which accounted for 23% of the Great Lakes population in 2002, had comparatively few persons employed in the wood products manufacturing industries. Similarly, Ohio which had 15% of the region's population, had fewer than 10,000 persons employed in all areas of primary and value-added wood products manufacturing.

Chart 27

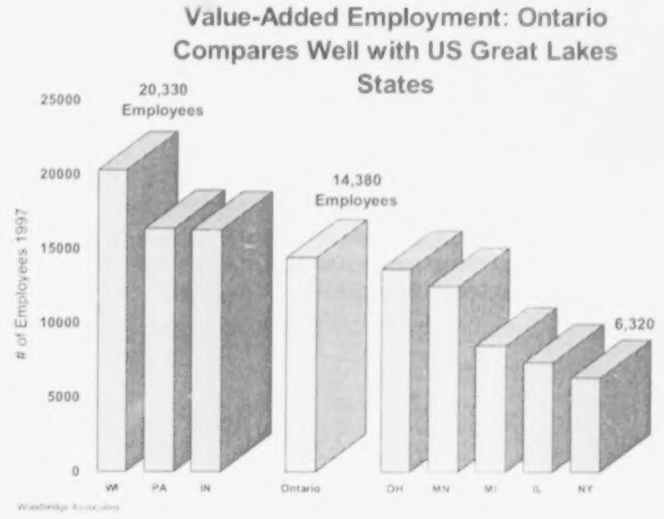
Primary Wood Products
Ontario Employs More People than the US Great Lakes States



In value-added employment during 1997, Ontario had fewer employees than some states, such as Wisconsin, Pennsylvania and Indiana where primary product manufacturing has evolved over the years into extensive value-added activities

Overall, however, employment in the Ontario value-added manufacturing industry compares well against other states such as Michigan, Illinois and New York (Chart 28).

Chart 28


Value-Added Employment: Ontario Compares Well with US Great Lakes States

Transportation and Distribution Logistics in the Great Lakes

Transportation and distribution networks are some of several reasons why the US Midwest and Great Lakes traditionally became a key part of the American manufacturing heartland.

The Great Lakes region is well positioned to receive inflows of raw materials and semi-processed goods for local manufacturing and value-added processing. Bulk products, such as iron ore and timbers, historically could be shipped economically into the region via the Great Lakes.

In the same way, the region is well positioned to supply many of the manufactured goods needed by the North East and other parts of the country. Regionally, there is also a large domestic market for many of these products.

The close concentration of similar and complementary manufacturing activities and supporting services in the Great Lakes, along with well developed road and rail networks and storage facilities, provides a high level of regional leverage for value-added wood product manufacturers in many parts of the area.

Industrial clusters of manufacturing activity mean that, in many instances, firms have supply networks within 100 miles of their processing plants. Large scale distributors are located in the region.

It is clear that the region has a competitive advantage compared with Ontario in many areas of product distribution. With the supply-chain evolution shift of power to distributors, this situation should be a major driver of marketing strategy for most wood product and value-added producers in Ontario.

Macro-Economic Outlook and Projections of Demand

As a basis for the product demand and wood product sales growth data presented in this report, Clayton Research Associates has provided detailed state-by-state economic and demographic projections, along with residential and non-residential construction forecasts. These are provided in Volumes 2 and 3 of the report, along with analyses of the data.

These projections and analyses, along with other data presented in Volumes 2 and 3, provide valuable market research data for Ontario firms seeking to enter or expand into the Great Lakes market region.

The opportunities are evaluated in detail in Volume 4.

Group A

Market Opportunities in Structural Engineered Wood & Building Components

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Group A: Market Opportunities in Engineered Wood and Building Components

Definitions

This section looks at market opportunities in the US Great Lakes for building components and structural engineered wood. It focuses on structural applications in residential construction. In addition, references are made to the demand for these products in non-residential and remodeling applications. Demand within the factory-built sub-sector is discussed later in Group C. A key feature of these products is that they are to a greater or lesser extent 'engineered' for specific purposes and designed to meet code-defined performance criteria.

Builders have a wide range of choices in the types of materials they can use for new construction and re-modeling. In roof construction, for example, they have a choice of over eight main products for rafters and/or joists. In roof beams, they can choose from at least nine basic categories. Within each of these, there are several species of wood at their disposal. Overall, the main choices of structural roof materials are either lumber or roof structural components such as wood trusses.

In wall construction, the builder has a choice of up to fourteen product options, including concrete, dimension lumber, panelized walls manufactured off-site or engineered wood products such as LVL and LSL.

> Architects, designers and specifiers have a wide choice of structural building materials from which to choose. Ontario's wood product producers and their distributors have to vie for attention.

A list of possible choices in various applications is provided in Appendix B.
In this section, we consider the following types of applications and concentrate on the structural building components and structural engineered wood products ('structural EWPs') shown in Table 6. Even with the short list of choices presented in the Table, it is clear that a large number of interchangeable and often competing products exist.

Table 6
Main Types of Wood Components and Structural EWPs -Roof Construction

Application	Products & Product Components
Roof Systems, Rafters & Joists Roof Beams	Lumber rafters and joists. Wood I-Joists Open web joists OSB used as web in I-Joists Stress rated (MSR) lumber used in roof systems Dimension lumber used for components Structural EWPs (LVL, LSL/TimberStrand, Parallam, Glulam) Solid wood beams. SIPs 2nd and 3rd Generation EWP beams Wood-based modular and whole roof systems

Woodbridge Associates Inc. See also Appendix B for an expanded list of products

Ontario producers supply some of these finished products to the US Great Lakes market. In other cases, lumber and structural panelboards (OSB) are sold to remanufacturers, component producers and structural EWP plants in the Great Lakes market.

It is important to consider within this report both the extent to which primary commodity wood products from Ontario and elsewhere are sold and consumed in the eight Great Lakes states, as well as shipments and potential markets within the region for the province's value-added structural wood products.

In Table 7, we show examples of the types of products use in structural floors. In particular, I-Joists have displaced dimension lumber joists and rafters to a considerable extent in many, but not all, areas. Others floor systems include open-web joists which are comparatively popular in states such as Minnesota.

In addition to these products, the builder has a choice of concrete or steel, particularly in first floor single family homes, multi-family first and upper floors and in commercial, office and industrial buildings.

Table 7

Main Types of Wood Components and Structural EWPs Considered in this Report -Floor Construction

Application	Products & Product Components
Structural Floor Systems **Floor Beams**	Dimension lumber joists Wood I-Joists (LVL and lumber flange) Open-web joists (parallel chord trusses) Floor systems, including engineered rim boards Solid wood beams Glulam Parallam LSL (TimberStrand) LVL

Woodbridge Associates Inc.

Engineered wood beams such as Parallam and Glulam were among the 1st generation of structural EWPs to rival timber and often displace increasingly scarce timber beams in structural floors. More recent generations of products such as LSL (TimberStrand) offer a complete engineered structural flooring approach and LVL is capturing market share.

The architect or designer has a number of fundamental choices for wall construction including various types of concrete, concrete block, stone, dimension lumber, panelized walls manufactured offsite, modular walls and structural engineered wood products. Table 8 shows the principal choices among wood-based products.

Table 8

Main Types of Wood Components and Structural EWPs Considered in this Report -Wall Construction

Application	Products & Product Components
Wall Systems	Dimension lumber LSL (TimberStrand) Wood I-Joists Panelized walls Modulized units (rooms) SIPs

Woodbridge Associates Inc.

Ontario already has established itself as a significant producer of structural wall panels. Many of the province's truss producers also manufacture and export wall panels. This technology is still in its formative stages and Ontario could take a leadership role in developing a globally competitive, leading-edge capability in this value-added product as part of a whole-systems supplier strategy.

> The wall systems market in the US Great Lakes is of vital importance to Ontario. 35%-40% of all softwood dimension lumber consumed in North American new residential housing goes into wall construction. Much of the province's lumber output is suited to this end-use.

Another important sub-sector of the building components and structural EWP business is the headers market. This comprises a range of products ranging from comparatively short length window and door headers to longer length load bearing headers required for single and double garages. Table 9 shows the types of wood products that are used in the headers market.

Table 9

Main Types of Wood Components and Structural EWPs Considered in this Report -Header Construction

Application	Products & Product Components
Window, Door and Garage Headers	Built-up dimension lumber Solid wood beams Glulam Wood I-Joists Parallam Glued and nailed box Wood Truss and open web trusses LSL (TimberStrand and Anthony Power Beam) LVL

Woodbridge Associates Inc.

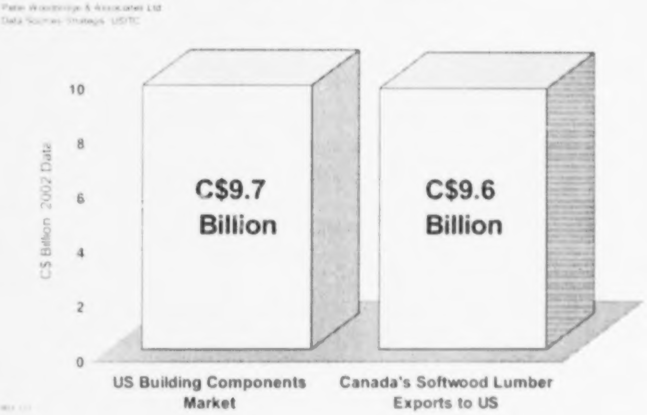
In view of the close connection between these building components and the doors and windows market, we also refer readers to the analysis of whole systems discussed in Group B (Millwork) of this report.

The US Structural Engineered Wood and Building Components Market

According to USITC estimates, apparent production of wood structural building components[18] in the U.S. rose strongly by US$2.2 billion from 1997 to nearly US$9.7 billion by 2002.

Chart 29

US Structural Building Components Market is Bigger Than Canada's Softwood Lumber Exports to the US



Peter Woodbridge & Associates Ltd
Data Sources: Strategis, USITC

Chart 29 provides an interesting point of comparison for the Canadian lumber industry. It shows that the value of the U.S. building components market is also almost exactly equal to the aggregate value of Canada's exports of softwood lumber to the United States.

Most of the US building components market is supplied from US sources (the US is also an exporter of these products).

In practical terms, only part of the US market is available to Canadian component and structural EWP producers.

The comparison provides a revealing perspective on the importance to Canada of access to the US market for its softwood lumber exports.

A growing number of wood product producers with operations in Canada and specifically in Ontario have become suppliers of building components and structural EWPs, and supply markets in the US. These include Weyerhaeuser, Buchanan, Tembec, Domtar and others.

A 2002 USITC investigation into conditions of competition in this industry provides valuable estimates of Canada's market share of the US engineered wood structural building components market. Key data are summarised in Chart 30.

Over the period 1997 to 2002, US imports of engineered wood structural building components increased. Even at their peak market share in 1999, however, imports in aggregate accounted for 6.9% of estimated U.S. domestic consumption[19], or an import market valued at around US$650 million.

By 2002, with increased new capacity in the US, the share of imports had dropped to 5.5% for all products in aggregate.

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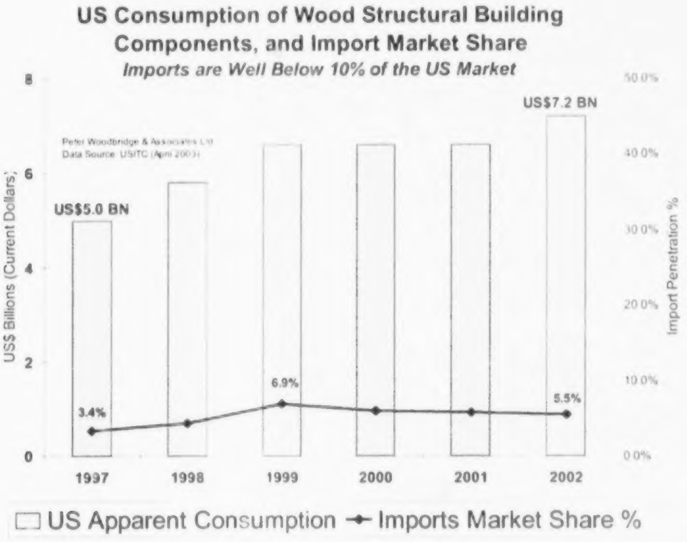
[18] Production defined by the USITC as comprising trusses and prefabricated panels plus engineered wood products. www.usitc.gov Publication # 3596 Table 3.1. Wider definitions indicate a substantially bigger market, of which wood is only part.

[19] USITC Report, ibid. Table 4-1

Definitions vary. When imports of other products[20] that are not included above are taken into account, the total value of imported structural wood and allied value-added building components is estimated to have been close to US$875 million in 2002[21]. So the import market share estimates provided above may be high.

Chart 30



I-Joists and other engineered structural building components accounted for the major part of US aggregate imports. In 2002, this was about 45% of the total (Chart 31). Another significant import item was wood trusses, notably from Ontario into the US Great Lakes area. These accounted for about 20% of aggregate imports by the US, or an import market value of around US$76 million in 2002.

Panelized walls and partitions accounted for less than 10% of aggregate US imports or a market value of around US$37 million in 2002, according to USITC estimates. As Chart 31 shows, there has been a steadily rising trend in US imports of wall panels.

Laminated beams and arches accounted for less than 5% of US aggregate imports and have shown very little growth over the past several years.

Canada is the dominant supplier of wood truss imports into the United States. These have a high bulk to value ratio and a comparatively short economic haul distance. Most suppliers have to be within a few hundred miles of consuming markets. Distances may be longer for industrial trusses and specialty orders, or where value-added services such as engineering and design are also provided. Most of Canada's truss exports to the U.S. are custom projects, frequently with extensive engineering design input.

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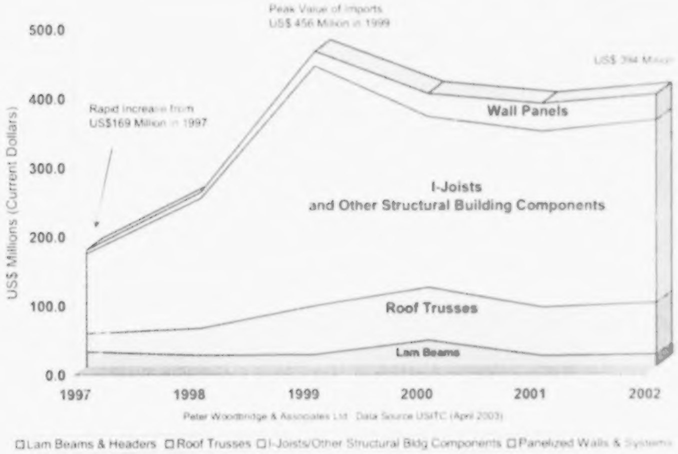
[20] Includes some products within HTS 4418.90.40 and HTS 4418.90.45
[21] US Trade data for NAICS 321213 and 321214

Chart 31

US Imports of Structural Building Components

Canada is Losing Market Share as US Capacity Increases



Peter Woodbridge & Associates Ltd. Data Source USITC (April 2003)

For most other products, however, other countries are important to consider as competing suppliers to Canada into the US.

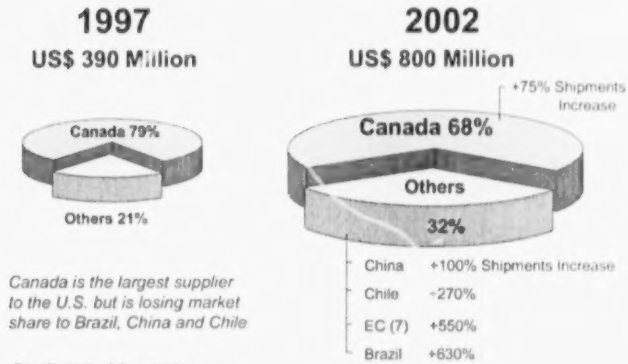
For the sake of illustration, in Chart 32, we have excluded trusses from the US import picture and show that several other countries have been expanding their share of the US import market for structural EWPs at a faster rate than has Canada.

While Canada remains the dominant volume supplier to the US, other countries such as Brazil, Finland, Chile and others have increased their share of the US import market from 21% in 1997 to 32% in 2002.

The overall inference of these analyses is that (a) Canada has not been keeping pace with US new investment and capacity in many engineered building components and structural EWPs and (b) offshore suppliers increasingly are targeting the US market and are expanding their share of US imports, currently at a low volume level but at a noticeable rate of increase. Issues relating to Canada's investment climate, and specifically the climate for advanced wood products technology investment in Ontario, are discussed in Volume 4 *Opportunities Report*.

Chart 32

U.S. Imports of Engineered Wood Products (Excluding Trusses)



Canada is the largest supplier to the U.S. but is losing market share to Brazil, China and Chile

Peter Woodbridge & Associates Ltd
Data Source: US Trade

Structural Engineered Wood & Building Components: Sub-Sector Analyses

For the remainder of this section, we examine the market for structural engineered wood & building components in the United States and US Great Lakes, with the goal of identifying opportunities for Ontario manufacturers. The layout of the section is as follows:

- Structural Floor Systems
- Structural Wall Systems
- Structural Roof Systems
- Rim Boards
- Structural Beams
- Headers

Structural Floor Systems

This comprises structural floor systems and floor beams. Structural materials used globally for floor construction in residential and non-residential buildings include concrete, steel, dimension lumber, large timbers and a variety of engineered wood products. In North America, the residential housing stock comprises homes with comparatively large square foot areas and large rooms requiring materials capable of long spans.

Compared with Japanese single family homes, for example, which average significantly less than 1500 square feet of floor space, American homes are substantially larger. In 2002, the average size of a single family home in the US was 2320 square feet and the median size was 2114 square feet.[22] In addition, the average size of North American homes is getting larger.

The extensive use of engineered wood, particularly products such as I-Joists, is largely a North American phenomenon. The displacement of dimension lumber by engineered wood products has been quite strong, although this appears to be reaching a saturation point in some applications.

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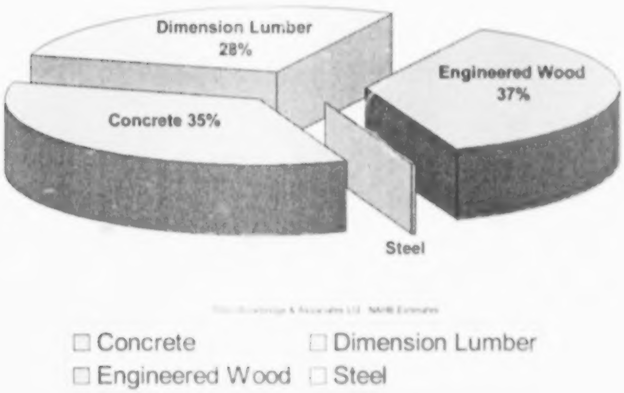
[22] NAHB data

Chart 33 shows that engineered wood is now the largest single group of materials used for structural floors in the United States, with a 37% market share. Cast-in-place and pre-cast concrete floors account for nearly 35% of all multi-family and single-family new construction. Dimension lumber and timbers account for 28% and steel less than 1%

Chart 33

Structural Floors -Materials Used



The I-Joist Business in North America

Of all engineered floor products, I-Joists (also known as I-Beams), have gained the most significant market share. From 1994 to 1997, the share of total floor area built with wood I-Joists grew from 20% to 30%[23]. By 2001, I-Joists accounted for almost 45% of the raised wood floor market in the US[24].

As a result, North American production of I-Joists went from 36 million metres (120 million linear feet) in 1987 to more than 242 million metres (796 million linear feet) by 1999 and was expected to reach 360 million meters (1.2 billion linear feet) by 2002[25].

According to APA data, there were 19 firms in the North American I-Joist business in the year 2000, of which 14 were located in Canada. The nineteen firms operated 43 plants in total. Analysis shows that, geographically, these plants were distributed across a wide area, often close to major metropolitan and growth areas for residential housing and commercial/industrial activity. In several instances, however, there are plants located in close proximity to LVL and/or OSB plants.

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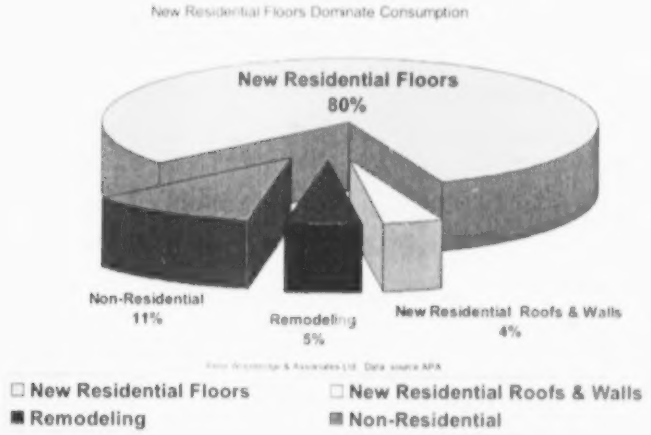
[23] *Lumber and Value-Added Wood Products*. Special Report. Industry Canada. Prepared by Forintek Canada Corp. (Sept 2000)

[24] Al Schuler, USDA, in 'Marketability of Hardwood LVL' (Feb 2002) and Craig Adair, APA (March 2001)

[25] RISI *Wood Products Review*, Jan 2000, cited in Industry Canada / Forintek, ibid.

Chart 34

I-Joist End Uses in 2001



[illegible] & Associates Ltd. Data source APA

The I-Joist business is very competitive. Historically, a few large firms (e.g. Weyerhaeuser/Trus Joist MacMillan) have dominated overall production capacity in this industry and have been the technology leaders. Some larger firms, or 'franchises' such as NASCOR, also have become significant players over the past five years or so. According to Taylor[26], the top I-Joist producers in 1998 included the following.

Weyerhaeuser (Trus Joist) (includes 2 Willamette plants)	10 plants
Louisiana Pacific	4 plants
Boise Cascade	2 plants
Georgia Pacific	2 plants
NASCOR	15 mini plants

The market share of I-Joists in new residential construction has grown very rapidly, with the greatest share being utilized in multi-family housing. Regionally, I-Joists have been slow to receive market acceptance in the South compared with the US West and North[27]. Although additional capacity has been added in all regions since 1998, the South has still lagged these other areas in terms of new capacity being installed.

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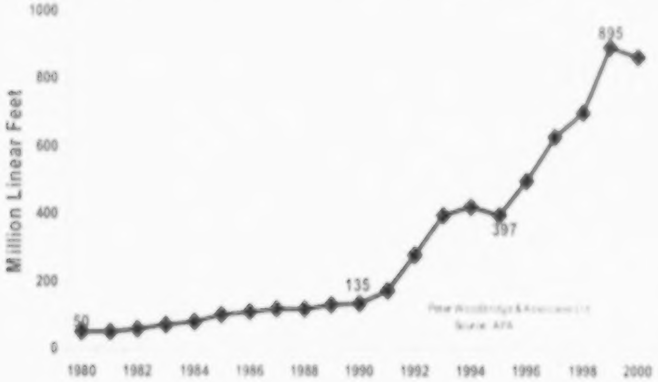
[26] Ibid

[27] Source WWPA

Chart 35

I-Joist Production in North America



According to the APA, 81% of I-Joist production is used in floor applications. Spans are variable, but tend not to exceed 40 feet (12 metres). Along with other structural EWPs in flooring and beams, I-Joists have gone a long way to facilitate the growth of longer spans and larger homes. Other attributes are discussed in the literature[28].

I-Joist Markets in the US

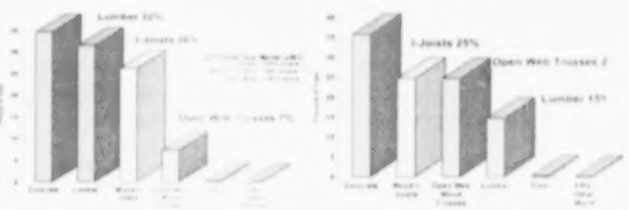
In single family new construction, wood I-Joists are used predominantly in ground and upper floors. To a lesser extent, they are used in roof framing (as rafters and trusses) and in some exterior walls.

In multi-family new construction, usage rates of wood I-Joists is proportionally lower per square foot area, but I-Joists along with open-web joists are important in upper floors where, in combination, they are the dominant material used in these applications.

Chart 36

US New Residential Construction
Structural Flooring Systems -Market Shares
All Floors Combined

Wood I-Joists Have a 25% Share of Each Market



Single Family

Multi Family

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[28] See, for example, Forintek report for Industry Canada (Sept 2000).

Chart 36 shows that I-Joists accounted for roughly 25% of the floor systems materials used to build single family and 25% of multi-family new construction in 2001. In both cases, concrete (including both cast-in-place and pre-cast) was the dominant material used for flooring systems.

Dimension lumber held a 26% share of single family new construction and 15% of the multi-family market. Open web wood trusses are used extensively in multi family new residential construction where they have a 25% market share compared with only 7% in the single family market.

Open web trusses for flooring have been well marketed to multi-family housing unit builders, where ease of access for plumbing, electrical wiring and HVAC are at a premium in the smaller square foot areas.

Steel flooring systems accounted for only a fraction of single family new residential construction in the US during 2001, and had a similarly small market share in multi-family construction.

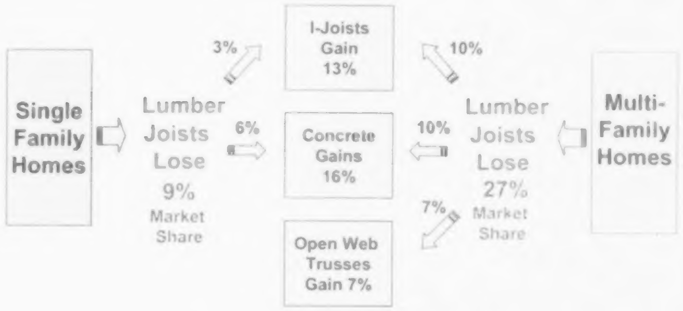
Dimension Lumber Continues to Lose Market Share

Dimension lumber, notably 2x10s, has lost considerable market share since the increased availability of structural EWP flooring systems. For all ground floors and raised floors in aggregate, the decline of dimension lumber for the US as a whole is illustrated in Chart 37.

Chart 37

U.S. New Residential Homes
Structural Floor Systems Market 1998-2001

Lumber Joists Lose to Concrete & Engineered Wood



Usage Rates Per Square Foot of Floor

Peter Woodbridge & Associates Ltd. NAHB [illegible]

It should be noted that these are usage rates per square foot area. This is important because the chart shows a dramatic decline in usage rates of dimension lumber, but the extent of the decline is being obscured by other factors, discussed below.

Chart 37 shows that in single family new residential construction for the US as a whole, lumber joists in the bellwether structural floor systems market lost an estimated 9% market share[29] over the period 1998-2001 alone.

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[29] Caution should be used with these estimates. For specific products and individual markets, the range of error can be quite wide. Readers are encouraged to contact Ed Hudson at the NAHB Research Centre to subscribe to full survey results. www.nahb.org

This was a period when exceptionally high rates of growth in single unit construction was taking place. It is widely perceived that dimension lumber is missing out in this market predominantly to I-Joists. However, the largest market share loss (6%) by 2x10 lumber was to concrete (notably on the ground floor). I-Joists gained 3% from dimension lumber.

Schuler, Adair and others have pointed that penetration of I-Joists used in the US raised floor market may be reaching a saturation point[30].

In multi-family new housing starts over the 1998-2001 period, dimension lumber lost a staggering 27% market share to other materials. 10% was lost to I-Joists and another 10% to concrete. Open web wood trusses gained 7% market share from 2x10 and other dimension lumber in the multi-family structural floor systems market.

So, in the multi-family market, it is clear for the US as a whole that the 17% combined loss of market share by dimension lumber to engineered wood flooring systems is sending a very strong signal from architects, specifiers, builders and framers about what they need. Remember too that flooring EWP prices are higher per lineal foot than traditional solid dimension. So there is value here for the constructors and homebuyers.

Overall gains by concrete were +16%, gains by I-Joists were +13% and gains by open web wood trusses were +7%.

Why Do Homebuilders Favour EWPs?

In part, it is because they are marketed and serviced well by the producers. Another reason is that they provide better structural performance, or at least are perceived to perform better by architects, specifiers, builders and framers.

It is also worthwhile remembering that substitution and displacement trends vary with the level of overall housing activity.

In busy times, with homebuyers waiting in the wings, keeping to the production and estimated move-in date schedule is vital. Callbacks are expensive and the homebuilder avoids them whenever possible. Accordingly, architects and specifiers (including building inspectors) define optimal engineering specifications.

The planning environment in the mid to late 1990's was conducive to increased engineered wood usage, and this coincided (not by accident) with significantly higher levels of manufacturing capacity.

Chart 38 illustrates the mindset of the time. Between 1995 and 1998, the US housing industry experienced a sharp ramp-up in single family starts. Starts rose from 1.1 million annually in 1995 to 1.3 million by 1998. The average pace of growth, around 65,000 new SF starts annually over the period, sent a 'growth and expansion' message to the industry and the supply chain.

The pace of SF activity increased yet again in the period 1998-2002, with an average 88,000 new SF units being constructed over this period. With increased shortages of skilled and semi-skilled site-labour over the 1995-2002 period (and continuing today), one of the results was a high rate of displacement of dimension lumber by engineered wood.

This was facilitated by related trends in specifying and distribution (e.g. whole package supply and site-assembly services by distributors, using cranes for upper floors, etc.)

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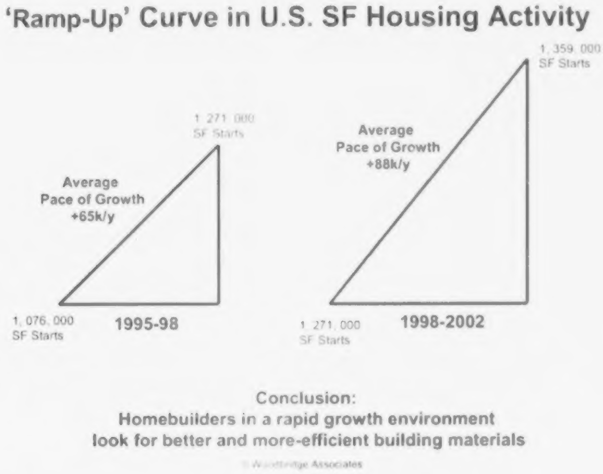
[30] Al Schuler and Craig Adair. See APA studies www.apawood.org

It remains to be seen what rates of displacement or substitution occur when overall housing market activity is lower and when competition between builders for available homebuyer business becomes very price and cost sensitive. Our field work indicates that this will depend on the type of builder.

Chart 38



Overall, with consolidation in the homebuilding industry, we would expect that most builders, once they commit to structural EWPs, won't go back to less predictable and more variable dimension lumber. Some prefer it, but most go with what's best for the job. Price differentials are another consideration.

Structural Walls

Panelization of wall structures is one of the value-added wood products which Ontario has developed well over the past decade. It is also a vital product group for further opportunities for the Ontario integrated wood products industry and independent value-added manufacturers and wall panelizers. There are four reasons for this conclusion.

- Walls consume between 35% and 40% of softwood lumber used in residential construction. This is one of Ontario's biggest single markets.
- Most of the growth in use of off-site fabrication of wall panels is taking place in the US Great Lakes region, which Ontario logistically is well positioned to serve.
- Ontario's main strengths in primary wood products manufacturing are in narrow dimension softwood lumber (2x3s, 2x4s and some 2x6 production), structural sheathing and structural EWPs (e.g. LSL /TimberStrand).
- Ontario's future competitiveness in wood products manufacturing and distribution lies in its ability to provide building systems and technical/service support targeted to specific users, rather than merely selling its current commodity production and value-added products largely on an open market basis (LSL is an exception to the latter).

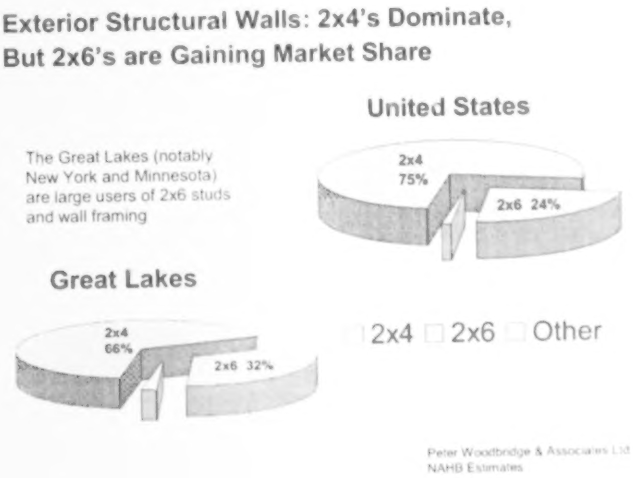
Much of Ontario's potential to expand its value-added industry will depend on its response to these challenges and opportunities. This will also depend on the industry's ability to coordinate these efforts with existing programs to promote wood use (*Canadian Wood Council* and the

Wood Promotion Network), and for Ontario to develop a clear understanding of where its competitive advantages lie and acting on them.

Eastern SPF

Eastern SPF output and structural softwood lumber exports predominantly are in 2x3s, 2x4s and some 2x6s. As a species, SPF is preferred among many builders for its light weight, consequent ease of handling and nailability. Ontario's eastern SPF output lends itself readily both to exterior wall and interior wall construction.

Chart 39



Exterior Structural Walls: 2x4's Dominate, But 2x6's are Gaining Market Share

Peter Woodbridge & Associates Ltd
NAHB Estimates

Exterior Structural Walls

In the United States, nearly 80% of exterior wall framing lumber used in structural applications for new residential construction is 2x4s, while 20% is 2x6s (Chart 39).

In interior walls, 2x4s again dominate with around 88% of market share. 2x6 walls are increasing their market share fairly quickly and now account for close to 6% of all structural walls.

As energy efficiency considerations develop, insulated 2x6 exterior walls become more popular and there is some growth potential also in SIPs for this purpose[31].

Interior Structural Walls

2x3 structural lumber has a very small share (1%) of the interior structural wall market in new housing (Chart 40), but are used for other purposes including temporary bracings and non-structural applications. As noted elsewhere in this report, Ontario's eastern SPF 2x3s are widely used in the factory-built residential and non-residential housing industry.

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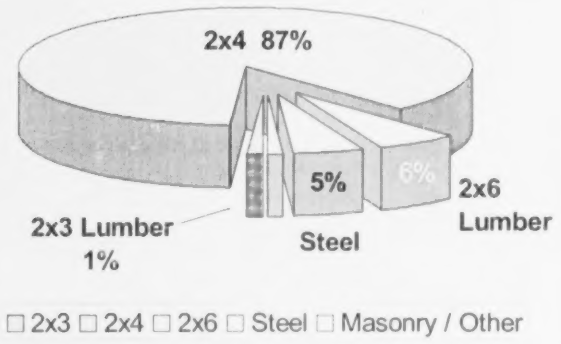
[31] However, Fell and Robichaud (Forintek) found in a 2001/02 survey that the systems that a sample of builders believed they would not use in the future were prefabricated steel (76% of those surveyed) and SIPs (69%). See Forintek Canada Corp. '*Attributes Demanded in Single-Family Walls*' (March 2002), Fell and Robichaud.

Chart 40

Interior Structural Walls: 2x4 Lumber Still Has the Lion's Share

Peter Woodbridge & Associates Ltd
NAHB Estimates



Steel has a 5% share of the residential structural interior wall market overall in the United States, but there are wide variations in the extent of its usage regionally and intra-state. Masonry and other materials account for about 1% market share.

Steel and the MF Market
In multi-family residential market, however, steel usage is much more significant and represents a formidable competitor for wood based construction. Wood and steel combinations are widespread, along with composites.

Steel and the Remodeling Market
Steel is not a significant competitor to wood in most areas of the residential single family remodeling, in either the shoulder trade or in the build-it-yourself (BIY) professional market.

Steel and the Non-Residential Market
Steel dominates many areas of new construction in light industrial, office and commercial buildings, but wood usage in concrete-steel-wood-brick/stone combinations accounts for a significant overall volume of wood use. In heavy construction, wood has only a small market share. Various initiatives are underway (e.g. *Wood is Good* and the *Wood Promotion Network*) to develop the use of wood in these non-traditional markets and a new study has been announced to look at the US non-residential market for wood[32] [33]

Structural Wall Panelization

Historically many framers and homebuilders have said that, all other things being equal, they would prefer to frame walls on site. They have better control over the materials, but their main argument is that site built fabrication allows them more scope for making timely adjustments of the walls and other parts of the building to accommodate errors (however minor, and sometimes major) made elsewhere on the structure, notably if the concrete foundations, lower floor joists and installed raised flooring are not square.

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[32] Wood Products Council with funding support from the US Forest Service and Forintek. Due for publication February 2004. See Engineered Wood Journal, Fall 2003.

[33] See also Wood Products Council (1995) and *'Wood Opportunities in Non-Residential Buildings'* Forintek Special Publication SP-46

Pulte has approached the problem of out-of-square concrete foundations and slabs, and has been able to utilize the economies of off-site fabrication, by using panelized foundations[34]

With increased use of engineered floor systems, better drying and faster construction times, on-site weathering of solid lumber today is by far a lesser problem than it may have been formerly.

Off-site panelization of exterior structural walls has become a growth business. Leading production homebuilders, such as Pulte, Centex and others, now have their own production facilities to supply these products, and more capacity is predicted.

Independent panelizers are numerous, both in the United States and Canada. Some supply the production builders, but most supply the medium to smaller scale progressive builders where speed of construction and the shortage of available site labour is a growing problem.

Types of Wall Panels

There are four types. Most panelized walls comprise (1) open (2) semi-open and (3) closed. An additional product is the structural insulated panel (SIP), which is sometimes used where energy efficiency in walls (roofs and complete buildings) is required.

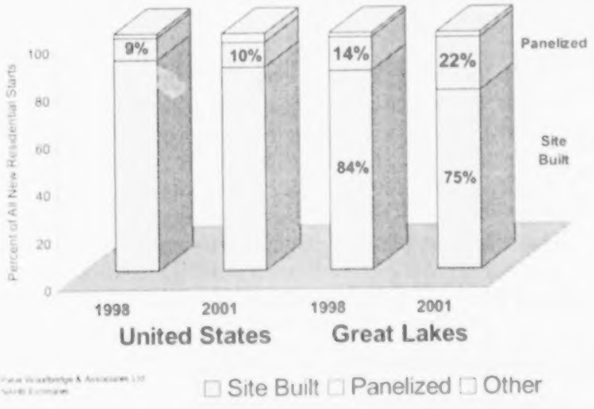
Manufacturing of panelized walls is predominantly of the semi-open type which comprise lumber and sheathing (about 65% of the total) while open panels (without sheathing) and SIPs rank about equally with 15% each. The technology of closed panels is not yet widely accepted among site-builders, although conceptually, it has many merits particularly for rural or remote areas, notably for small builders.

The Market is Shifting to Panelization

The trend to panelization varies widely by region, by state and even by local area (reflecting local circumstances and individual builder's preferences). One of the main drivers is the shortage and cost of site-labour. Another driver is the increased use of engineered wood products and the overall trend to systems building.

Chart 41

Great Lakes: Significant Shift to Panelization in Exterior Structural Walls



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[34] Alan Laing, Pulte Homes presentation at 'Exploring New Paths', a conferenced sponsored by Forintek and BC Wood, Vancouver, Sept 2003

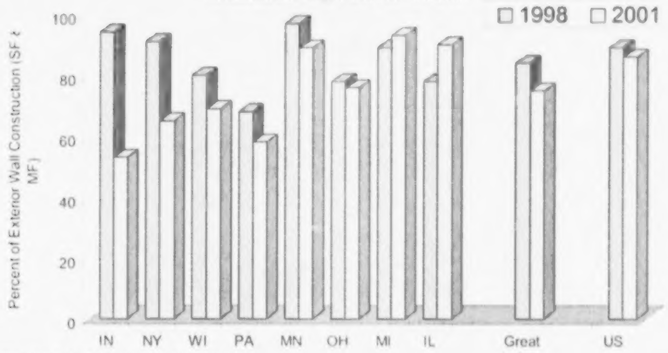
In the United States overall, panelization of exterior structural walls accounted for around 9% of total linear feet of wall area in 1998. Usage increased slowly. By 2001, panels accounted for around 10% (Chart 41).

In the US Great Lakes (and in the North East) on the other hand, the adoption of off-site fabrication has been much more robust among framers and homebuilders. In 1998, for the Great Lakes region as a whole, panels had a 14% market share. This continued to grow rapidly and, by 2001, panels share had increased to 22%. In other words, panelized walls accounted for the equivalent of roughly 1 in 5 exterior structural walls used in residential new housing in the Great Lakes in 2001.

Our field surveys indicated that the level of interest in purchasing pre-fabricated wall panels was particularly strong among builders of multi-family homes, even though this market segment consumes less of the total volume than single family unit builders. Production builders are the other large user group.

Chart 42

Great Lakes: The Decline of On-Site Fabrication of Exterior Walls is Greatest in Indiana and New York



Peter Woodbridge & Associates Ltd NAHB Estimates

The decline in on-site fabrication for single and multi-family combined is illustrated in Chart 42. It is readily evident in Indiana and New York, where off-site fabrication of exterior structural walls is extensive and where multi-family construction levels are high. In some areas, such as Michigan and Illinois, on-site fabrication has gained market share slightly. Some builders have their own fabrication facilities on-site, and the output of these is regarded, for the purposes of this report, as constituting off-site (or potential markets for off-site suppliers of these products).

The economics of off-site fabrication of exterior structural walls are defined as not just the shortage and hourly cost of framing labour. Other material and labour cost savings may be involved, including the pre-drilling of studs for wiring, the insulation provided in closed panels and 'whole package' supply of doors and windows.

Systems approaches to homebuilding and non-residential construction mean that designers at remote locations can respond quickly to changed specifications on site, and on-time delivery can provide savings in on-site storage of materials, ensure less pilferage and fast construction times. There can be quality considerations too, where off-site fabrication ensures a weather-sealed building envelope and reduced risk of the effects of unseasoned or high moisture content wood.

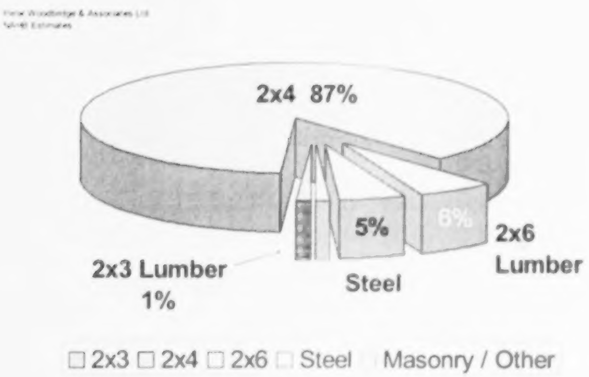
Interior Walls

Ontario's production of 2x3 lumber is not well represented in interior structural wall construction in the new residential construction market. In the US, 2x3s account only for about 1% of materials reported by framers and homebuilders as the material they use for this application (Chart 43).

By far the lion's share of lumber sizes used is 2x4, which held an 87% market share in 2001. In addition, 2x6 lumber accounted for a further 6%. The use of 2x6 is greater in exterior than interior walls due to the nature of exterior walls for insulation and other factors.

Chart 43

Interior Structural Walls: 2x4 Lumber Still Has the Lion's Share



Product Quality Considerations

The Great Lakes interior wall market (as well as the exterior wall market) is an important consideration for Ontario's softwood lumber exports, which is a major producer of 2X3's and 2X4's.

During our field work, it became evident that the perception exists among users in the Great Lakes that eastern SPF is inferior in quality to western SPF. We believe this to more perception than reality, but it is of considerable potential concern and is addressed in Volume 4.

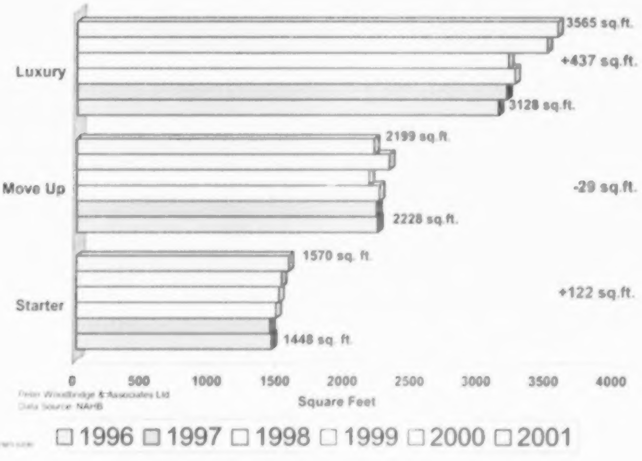
Structural Roof Systems

With increased average home sizes, higher incomes and the wider spans and other features possible with structural engineered wood products, it is no surprise that architects and designers have added considerable variety to recent new home designs.

The upward shift in average home values for new construction, and particularly the recent growth of luxury homes (Chart 44), has contributed to the homeowner's desire for more architectural features, including cathedral ceilings, higher pitches and more adventurous shapes (fewer gables and more hip roofs).

Chart 44

Size of US New Homes by Price Point



Peter Woodbridge & Associates Ltd
Data Source: NAHB

While many of the above features are found in new homes offered by builders at every price point, the number and variety of them tends to increase with the price of the home. Location and building codes also have a strong influence.

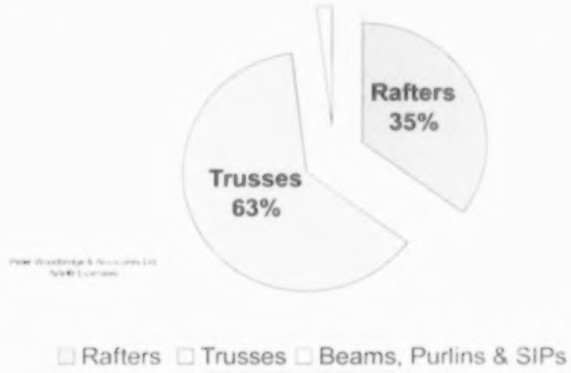
The type of construction materials used can vary with price point (notably the use of exposed beams and other features) but the use of wood roof trusses (along with I-Joists and some other structural engineered wood products) is common to new home construction at all price points.

The main differences in this respect may be on a geographical basis where ownership housing may use structural EWPs extensively while rental housing may not.

The technology of roof construction changed some time ago. Today, 63% of single family dwelling roofs in the United States are made with wood trusses. This compares with 35% for rafters and 2% for beams, purlins and structural insulated panels (SIPs) (Chart 45).

Chart 45

US Single Family New Homes
Type of Wood Roof Construction 2001



There are regional and local variations to this average, and differences between builders and the type of home being constructed. Many new homes involve a mix of construction methods with rafter-truss mixes being increasingly common.

There are considerable differences too in the types of wood (species, sizes) used for rafter and beam construction compared with the dominant use of 2x4s and 2x6s in most residential new construction using trusses. I-Joists and steel are used in single family new home construction, but their market shares are low.

Structural insulated panels (SIPs) are gaining in popularity with some builders, and this is a growth market in some regions. With SIPs, the approach to roof framing is different.

Roof Truss Technology

Early trusses were assembled with nailed plywood gussets until metal plates were invented around 1950. In fact, most wood truss production plants are small scale and many are independently owned. Much of the technological leadership in this field has come from the truss plate manufacturers (e.g. Mitek). Mitek and other plate suppliers also provide the truss producer (and the builder-framer) with computer software programs and mitering equipment.

Pre-engineered, metal plate connected roof trusses are widely used also in non-residential construction including office roofs, and industrial and commercial buildings. The non-residential sector is an important market for many of Ontario's truss producers and exporters.

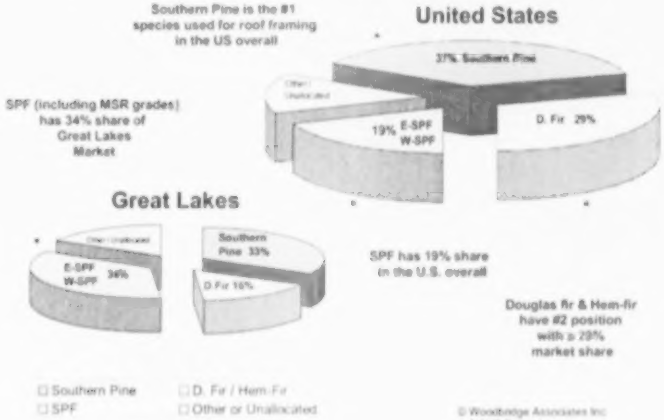
In particular, the agricultural market is still dominated by wood trusses even though steel trusses are making inroads into this application. Use of wood trusses in commercial buildings currently is low, but offers considerable potential and use wider dimensions of lumber.

Trusses offer long clear spans. The use of machine stress rated (MSR) lumber allows designers to reduce the over-specification of safety factors in truss design with corresponding cost savings. There are some related species implications. Southern Pine has natural strength attributes that make it very suitable for truss manufacturing. Typically it is priced below stress rated 1650f western SPF and Fir/Larch and sells for about the same level as the equivalent eastern SPF 1650f MSR grades.

A new stress rated grade is being developed by the southern pine industry. It should be noted that species considerations, code stress ratings and machine stress rating technology are very relevant to the competitive position of each of the major North American supply regions in various markets (Chart 46).

Chart 46

Species Used for Roof Trusses and Rafters



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NAHB Estimates

Sampling errors in these estimates mean that these numbers could vary by a few percentage points. Not all species of origin estimates from framers and builders are reported accurately, but the overall picture is considered to be valid.

For the US Great Lakes region, SPF is about on par with Southern Pine for market share – at around 33% to 34% each. Douglas-fir and hem-fir are found less frequently in the region, either in the form of dimension lumber used by local truss producers or in terms of trusses imported from outside the Great Lakes area.

The ability of eastern SPF from Ontario to compete with western SPF in roof truss applications is considerably enhanced if Ontario-based producers can offer an MSR grade.

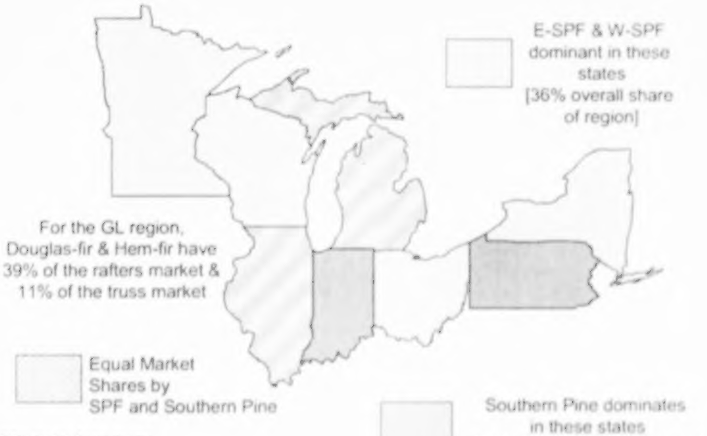
By state, there are wide and sometimes surprising variations in the dominant species used by truss producers located in the Great Lakes, and in terms of the finished trusses shipped into the region.

Chart 47 shows that Southern Pine dominates very heavily in two of the eight states – Pennsylvania and Indiana.

Southern Pine is well represented in the pattern of wood truss consumption of most states within the region and it competes about equally for market share with SPF in Illinois and Michigan (which, as noted previously, is Ontario's #1 export market for wood products).

The chart also shows that eastern SPF and western SPF (including MSR) dominate consumption in Wisconsin and Minnesota (strong markets for western SPF MSR grades), Ohio (a strong market for Ontario) and New York (well-served by producers in Quebec).

Chart 47
Great Lakes Truss Market – Consumption by Species (2001)


E-SPF & W-SPF dominant in these states [36% overall share of region]
For the GL region, Douglas-fir & Hem-fir have 39% of the rafters market & 11% of the truss market
Equal Market Shares by SPF and Southern Pine
Southern Pine dominates in these states [36% overall share of region]

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The Rim Board Market

A rim board is the wood component that fills the space between the sill plate and bottom plate of a wall or, in second floor construction, between the top plate and the bottom plate of the two wall sections[35]. The rim board ties the floor joists together. It is an integral component in an engineered wood system because it transfers both lateral and vertical bearing forces.

The traditional product used for rim boards was dimension lumber. However, technological changes in building systems, and the extensive use of wood I-Joists in particular, has resulted in displacement of dimension lumber by new generations of engineered rim boards. Dimension lumber is not compatible with these new generations. APA performance rated rim boards can be manufactured using the following materials:

- Plywood
- OSB
- Glulam
- LVL
- LSL (laminated strand lumber[36])

These engineered boards have less shrinkage than lumber and can precisely match the depth of wood I-Joists and other engineered wood framing components. Manufacturers supply lengths up to 24 feet.

The displacement of dimension lumber by engineered wood rim boards was already extensive by 1998, as shown in Chart 48. Based on NAHB estimates, the chart shows the share of the US rim board market (used in conjunction with wooden I-Joists) accounted for by the various rim board products.

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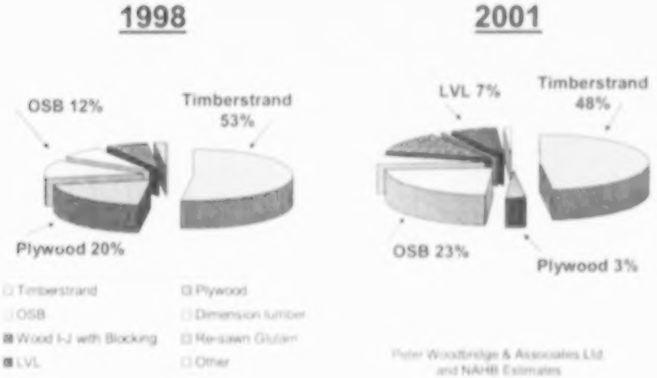
[35] APA

[36] LSL (laminated strand lumber) is widely known in the trade as '*TimberStrand*' which is the registered trademark of LSL produced by Weyerhaeuser / Trus Joist. For ease of understanding in this report, we use the term LSL to mean Laminated Strand Lumber (TimberStrand). LSL can also refer to Laminated Structural Lumber, such as the Anthony Power Beam®, which we include as glulam.

Chart 48

OSB and LVL are Gaining Market Share in the US Rim Board Market



Peter Woodbridge & Associates Ltd
and NAHB Estimates

TimberStrand has been the dominant product on a national basis, accounting for 53% of usage in these applications in 1998. Plywood held a 20% market share as recently as 1998. However both products declined in market share (even though overall volume consumption was up) by 2001. Plywood now has only 3% of this market.

An increasing share of this market is being accounted for by OSB and, to a much lesser extent, LVL. In particular, OSB raised its market share from 12% of all materials consumed in this application in 1998 to 23% by 2001. LVL is an emergent product in this application in some states and by 2001, already captured 7% of the market. But LVL is a premium product in this application with a high opportunity cost in the beams and headers market which tends to be its highest and best use.

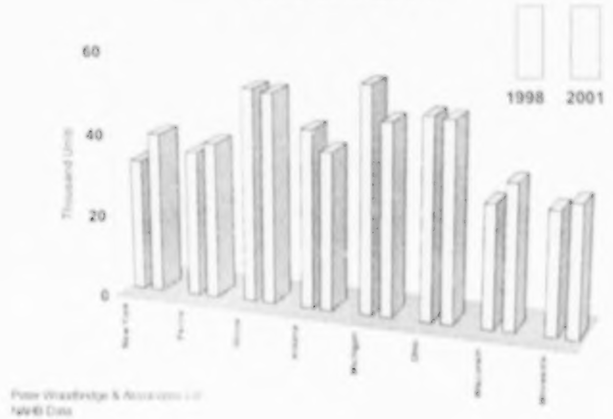
Great Lakes Rim Board Market

As already noted, the rim board market in the US has undergone significant changes over the past several years as technologies have advanced and structural EWP (I-Joists) and flooring systems usage has increased.

We estimate that, despite almost no change in aggregate housing starts levels in the US (but larger sized homes), the rim board market grew by nearly 23% over the period 1998 to 2001.

Chart 49

US Great Lakes Housing Starts 1998 and 2001



Peter Woodbridge & Associates Ltd
NAHB Data

In the Great Lakes region, aggregate housing start levels also remained unchanged over this period (Chart 49). There were significant changes in the types of rim board products used in the region.

These also varied from state to state. Table 10 identifies the states in which consumption of these products is both dominant and growing or, alternatively, declining (Illinois and Ohio). All standard homes must use rim boards, so these rankings reflect rates of change in housing starts and other end-use applications.

Table 10
Growing and Declining Markets for Rim Boards in US Great Lakes

Dominant & Growing (1998-2001)	Declining (1998-2001)
Minnesota *Wisconsin* *Pennsylvania* *Michigan* *New York* *Indiana*	*Illinois* *Ohio*

Peter Woodbridge & Associates Ltd. and NAHB estimates

Table 11

US Great Lakes Rim Board Market –Key Products Only

Product	Market Penetration (market share as % of total consumption all products)		
	Low <25%	**Moderate 26%-50%**	**High >50%**
TimberStrand	Indiana (high) New York Pennsylvania (low)	Minnesota (high) Illinois Michigan	Wisconsin (high) Ohio
OSB	Wisconsin (high) Minnesota	Illinois (high) New York Michigan Ohio (low)	Pennsylvania (high) Indiana
LVL	Indiana (high) Michigan Pennsylvania Ohio Illinois New York Wisconsin (low)	Minnesota	

Peter Woodbridge & Associates Ltd. and NAHB estimates for 2001

TimberStrand

For the US Great Lakes overall, TimberStrand is well established in every state for rim board applications in single family housing associated with the use of I-Joists.

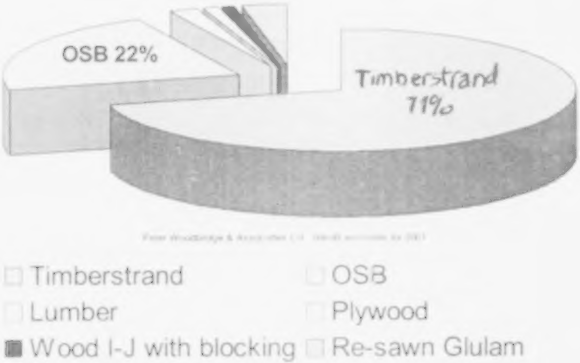
In most states, excluding Ohio, TimberStrand has lost market share over the past few years, notably to OSB and LVL.

Consumption patterns vary considerably. In Wisconsin, for example, TimberStrand dominates overall consumption (Chart 50) accounting for a 71% market share.

Comparatively low levels of market penetration for TimberStrand are found in Indiana, New York and Pennsylvania.

Chart 50

Timberstrand Dominates in the Wisconsin Rim Board Market



It is likely that the new state-of-the art TimberStrand plant location at Kenora, Ontario (which aims to export 70% of its output to US markets) will have a significant impact on the US Great Lakes market over the next several years, notably in structural EWP packaged sales to pro-dealers and direct sales to production builders.

OSB

The increased acceptance of OSB in North American markets was illustrated earlier and showed a market share increase for this product from 12% to 23% of total consumption in rim board applications between 1998 and 2001.

Significant levels of market share growth over this period were achieved in Indiana, Michigan and Wisconsin, much of which is supplied from Canadian OSB mills. Overall, high levels of OSB penetration into the rim board market have been achieved in Pennsylvania and Indiana.

LVL

As the new player in rim board markets, LVL has comparatively low penetration in almost all markets except Minnesota, where it accounts for about one-third of all uses.

Structural Beams

Structural beams are used in a wide variety of applications in residential and non-residential construction, and usually are classified as comprising:

Floor beams (first and upper floors)
Roof beams

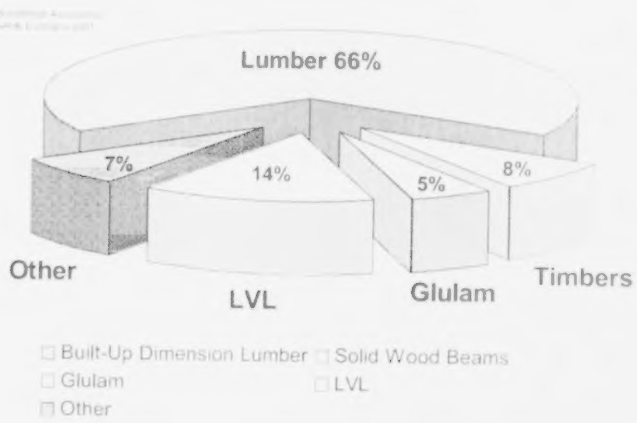
Beams used in floors include support beams, which provide a bearing point for floor joists, flush beams which are recessed into the floor and floor-edge beams that typically support the edge of a loft or stairway.

Growth in the average size of North American homes is reflected in the increased use of engineered wood beams. Formerly, wider spans were possible only with built-up dimension lumber (2x10s, 2x12s and 2x14s, when these were available) along with steel beams or glulam.

The decline in wide dimension supplies above 2x10s, reflecting the smaller diameter of timber in North America's industrial forests standing inventory, and builders' preferences for a compatible wood product, has assisted the rapid acceptance of 1st generation engineered beams such as LVL and Parallam. I-Joists and open-web beams also are used in some heavy load-bearing applications. Some 2nd generation beams are now beginning to become available, while others are in the development stage and require code approval.

Chart 51

Dimension Lumber Still Dominates the US Roof Beams Market



The three components of the US beams market, namely first floor beams, upper floor (or raised floor) beams and roof beams, vary in the types of products they use.

Glulam, for example, has a higher market share in the raised floor market than in first floors. The same is true of Parallam, which may be also be used as an appearance beam. Steel, on the other hand, is used more frequently in first floors than in upper floors.

In the roof beams market, dimension lumber dominates with a market share of around 66% (Chart 51).

Douglas-fir, western SPF and Southern Pine compete for this market. Ontario generally does not produce this product in dimension E-SPF lumber. LVL is the next most popular product specified by architects and, in 2001, accounted for a market share of about 14%. This is an important market for timbers, which had an 8% market share in 2001. Glulam accounted for 8% of the roof beam market.

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Chart 51

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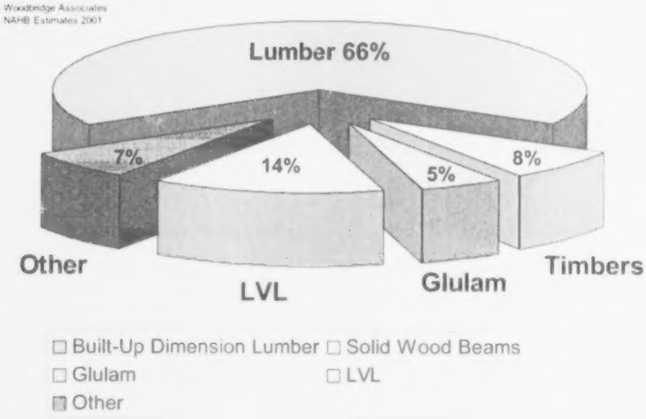

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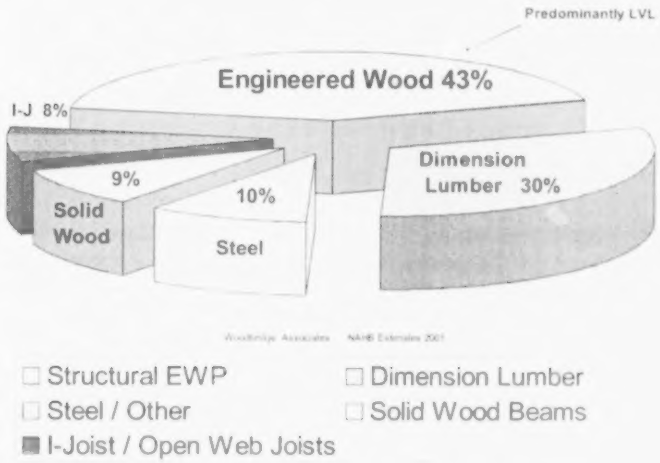
Chart 52

EWPs Dominate the Floor Beams Market

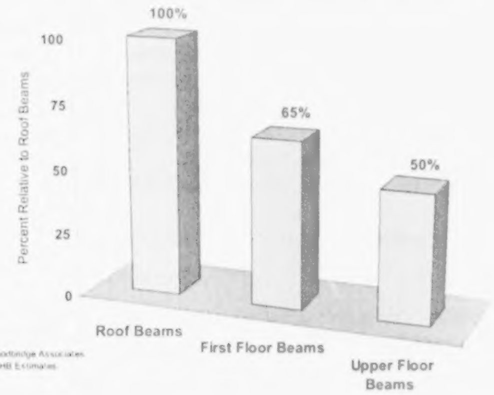


Woodbridge Associates NAHB Estimates 2001

In the US floor beams market, structural EWPs dominate with an estimated 43% market share in 2001 (Chart 52). Of these, LVL beams account for the largest share, followed by glulam, Parallam and some TimberStrand. Steel beams have a 10% share of the US floor beams market and, as noted earlier, are used mostly in first floor applications.

Chart 53

Relative Size of the US Structural Beams Market 2001-02



Woodbridge Associates
NAHB Estimates

Dimension lumber had a 30% market share in 2001 and solid wood beams accounted for a further 9% market share. Displacement of dimension lumber continues in this market, and further market share increases are predicted for structural EWPs.

Chart 53 provides an index of consumption with roof beams being the most important volume market, followed by 1st floor beams (65% the size of the roof beams market, in overall consumption) and upper or raised floor beams (50%).

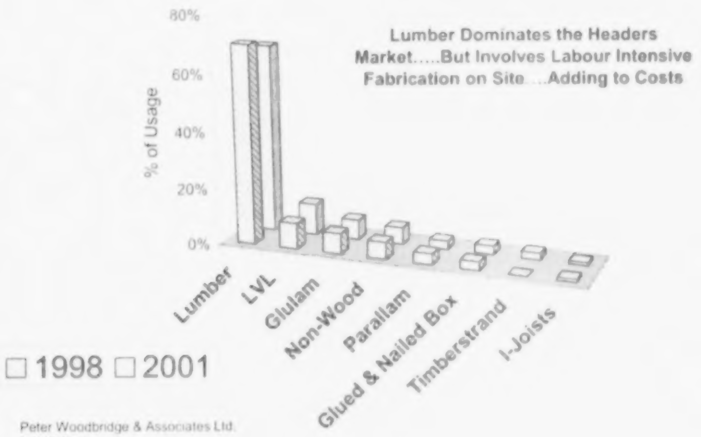
The Headers Market in the US

Headers are structural beams used above windows, doors, garage doors and other openings.

There is a wide variety of choices of materials available for the framer, including engineered wood (LVL, Glulam, Parallam and TimberStrand) and engineered components (I-Joists and wood trusses) as well as steel and concrete. However, the market is dominated by dimension lumber which accounts for 67% to 70% of all materials used, by volume.

Chart 54

US Headers Market



Peter Woodbridge & Associates Ltd.
NAHB Data

Chart 54 shows that dimension lumber really has no close rivals in this market at the present time. Over the past five years, TimberStrand (3% market share) has been introduced into the market and has displaced Parallam and glulam, notably in short spans. LVL (11%) is versatile in this market and is the closest rival to dimension lumber. Some framers use doubled-up LVL, while others use single or double I-Joists (5%) to meet the structure's span and width requirements.

Glued and nailed boxes (2%-3%) are labour intensive and indicate the underlying weakness and opportunity in the headers market. Namely, that most materials currently used in the headers market involve costly site-fabrication. We calculate that the labour-in full cost of on-site fabricated headers provides a substantial financial incentive for a better technological and labour-saving solution in this application.

Header Market Demand in Great Lakes States

The US Great Lakes region is a potential opportunity for an Ontario-based cost-effective solution to the headers situation. There are some regional variations that may alter the market potential.

In New York, for example, dimension lumber accounts for an even higher percent (75%) of the headers market while, in Michigan, LVL already has captured 20% of this market. Nevertheless, the magnitude of the opportunity and also the ability to address various common problems associated with window (leakages) and door framing offers a challenge to lumber and building materials producers.

Systems Approach to the Headers Market

The "value-added" in windows and doors exists in the window itself, or the door. These have to meet various criteria, such as functionality and appearance or aesthetic appeal. Dimension lumber that is not properly dried and stable can lead to subsequent warping and loss of functionality.

Use of fingerjoint lumber for vertical applications (e.g. door jamb and window rough openings) can provide dimensional stability and help prevent this frequently occurring problem.

Alternatively, a systems approach that addresses the fundamental goals of the application and provides optimal wood-based materials solutions could provide a significant growth opportunity for Ontario's extensive output of narrow width lumber (2x3 and 2x4).

Looking forwards, the "value-added" of a systems approach lies in the ability of the LBM industry to supply a completely waterproof building envelope. In addition to this, to provide other construction attributes, such as effective insulation barriers to heat and cold and the supply of healthy air within the building.

Today, site construction methods comprise a loosely integrated collection of individual systems (flooring systems, framing systems, HVAC systems, window systems, sheathing systems, etc.) that frequently do not always unite together optimally. Construction costs are excessive and our previous studies[37] have concluded that up to 25% of single family housing construction could be driven out through:

- Elimination of excessive development costs.
- Adoption of more efficient construction methods and, ultimately, whole building technologies; and
- Reduction of overspecification of materials in building design.

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[37] See page 15, chart 12, *Manufacturing of Value-Added Wood Products in Western North America: How Competitive is BC? (March 2003)*. Produced for the IVAWA by Peter Woodbridge & Associates Ltd. Available as a free download at www.woodbridgeassociates.com

Group B

Market Opportunities in Millwork

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Group B: Market Opportunities in Millwork

This section looks at market opportunities in the US Great Lakes for wood windows, doors and other millwork. It focuses on residential construction and the remodeling market. References also are made to non-residential and factory-built markets where appropriate.

Windows and doors and their respective headers can be considered as a system. With increasing complexity of architecture and the multiple use of wood, steel and concrete in many homes, garages and industrial-commercial buildings, the structural demands on headers merits a systems approach.

The per-unit-value of windows and doors is increasing, notably in luxury homes. Faulty fittings of windows and doors are a regular key source of callbacks in all price ranges. Mold and related litigation issues in the building envelope and around window openings and settings creates opportunities for the wood industry.

New residential and remodeling markets are large consumers of fiberglass, vinyl, wood and aluminum windows. Metal, wood, vinyl and many composites are used for doors and/or door frames. Wood, MDF and composites are used extensively for mouldings. These markets are extensive users of non-wood materials as well as solid wood (domestic and exotic hardwoods), MDF, engineered laminated flooring and a variety of composite products.

Two main groups of millwork are reviewed in this report. They are:

- Wood Windows & Doors;
- Other Millwork, including Flooring.

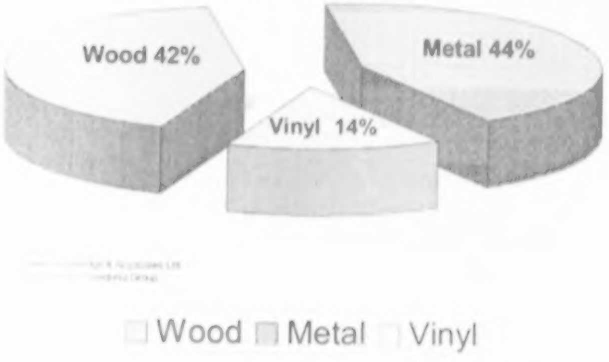
Wood Windows & Doors

Wood is a prime traditional material associated with wood windows and frames. Today, however, the homebuyer and the builder (in new residential construction) and the homeowner and design-remodeling company (in home renovations) have a wide choice of alternatives from which to choose.

Chart 55

US Demand for Windows & Doors
(Residential and Non-Residential) 2002

US$ 22BN in 2002



Wood accounted for about half of all prime residential window unit sales in the US in 2002[38]. In general, wood is most often preferred in new construction while vinyl dominates in the window replacement market. However, the choice of material also depends on the type of housing and price point. For residential and non-residential windows and doors, Chart 55 shows that wood accounted for a smaller overall market share than metal in the residential market.

In some applications and price points, wood windows are not made of wood in isolation. Today, vinyl and aluminum are used extensively for cladding the exterior of wood windows.

Vinyl windows were introduced in Europe more than 45 years ago and are now the most widely specified material for European installations[39]. In North America, vinyl is the fastest growing type of window. They are projected to continue to gain market share (Chart 56). Aluminum windows have been losing market share in many markets and this trend is expected to continue.

Chart 56

US Window & Door Market is Shifting to Vinyl and Metal
(Includes Residential and Non-Residential Demand)

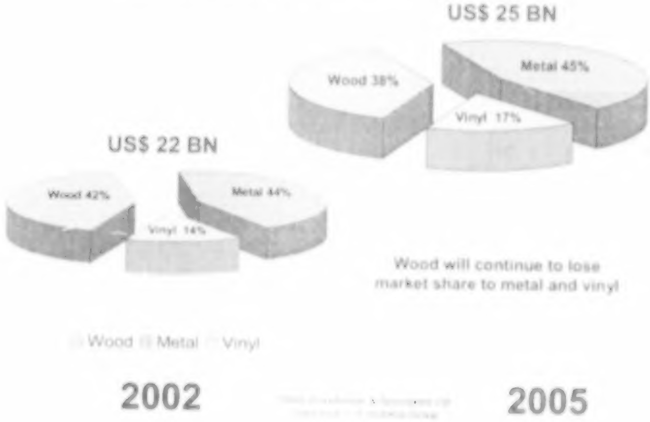


Chart 56 shows projections by the Freedonia Group. It anticipates a significant level of overall market growth in residential and non-residential windows and doors rising from around US$22 Billion in 2002 to US$25 Billion by 2005. This is a faster pace of growth than for residential housing starts alone and reflects strong per-structure demand both in the new construction and home improvement market.

Over this time period, vinyl's share of the rising level of demand is forecast to increase from 14% in 2002 to 17% by 2005. This growth will be at the expense of wood (declining from 42% to 38%) and metal (declining from 45% to 44% of the market).

US Imports

The US has an extensive wood windows and doors industry, but runs a sizeable trade deficit in these products. In 2002, the US imported US$625 million of wood windows and doors, while exporting US$130 million. The US trade deficit in these products has been increasing consistently in recent years (Chart 57).

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[38] *Window World* Spring 2003
[39] *Door and Window Maker* November 2002

Chart 57

US Trade in Wood Windows & Doors

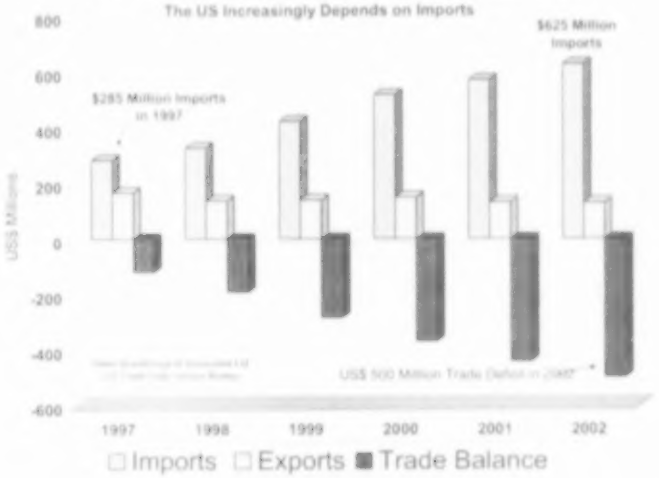
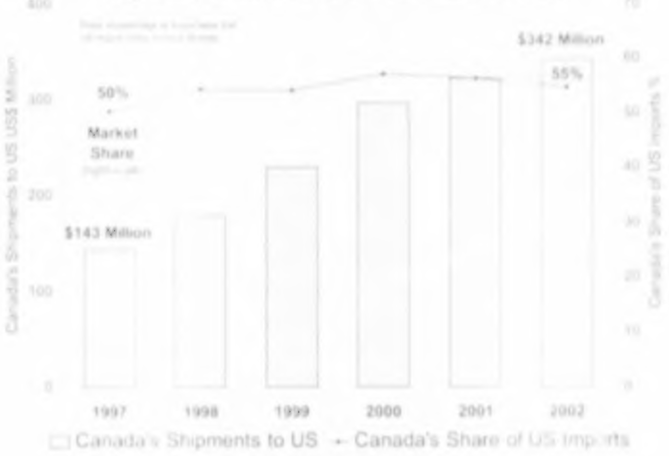


Chart 57 shows that US imports of wood windows and doors has grown by 220% from US$285 in 1997. Many of the window imports are classified as wood, but may include significant elements of vinyl and aluminum cladding. Imported doors and frames also comprise a wide range of composites using wood as a base.

Canada is the dominant import supplier to the US of wood windows and doors. In 2002, these were valued at US$342 million (Chart 58), up by 140% since 1997. Canada's market share in US wood window and door imports has remained fairly constant at 50%-55% of the total import market.

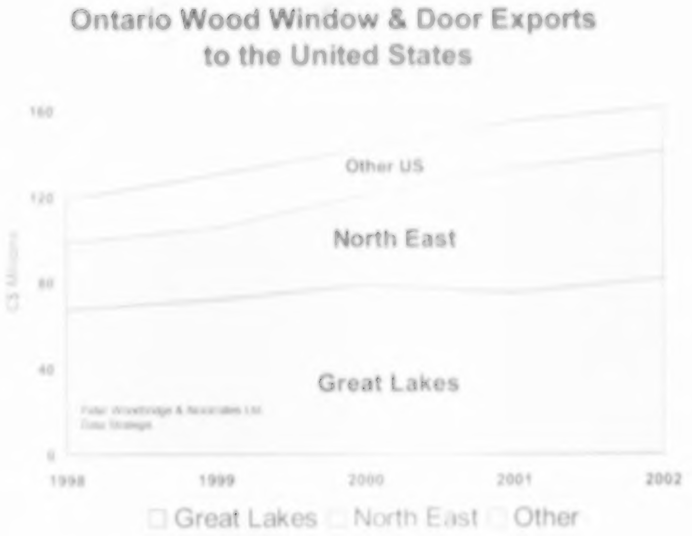
Chart 58

Canada is the Dominant Supplier Of US Imports of Wood Windows and Doors



Ontario's wood windows and doors industry is a key supplier to the United States and ships products that reflect, not just wood usage, but the full range of vinyl, aluminum and composites discussed above. The importance of various US markets for Ontario's wood windows and doors exports is summarised in Chart 59.

Chart 59



The chart shows that the US Great Lakes region is the most important market for Ontario accounting for 51% of its exports of these products to the United States in 2002. This was down from 57% in 1997. Much of the growth in Ontario's exports has been to the North East region, notably Massachusetts and Connecticut. Shipments to the North East have doubled in value over the past five years. However, shipments to the Great Lakes also increased by about 20% over this period.

Technology [40]

By using advanced bonding systems, window and door makers can recycle off-cuts from wood window production into composite products. These offer many of the advantages of wood, but typically are available with greater uniformity of quality and are cheaper.

Andersen Windows in Michigan is the world's largest window manufacturer. It already makes most of its windows using its patented material *Fibrex* – a mixture of wood fibres and PVC. Mikron Industries uses a wood-plastic composite based on a thermoplastic alloy. In addition to providing the main profile, composite lumber cab be used for parts of window and door frames. In Canada, Loewen Windows, which is among the country's largest wood window producers, uses Douglas-fir, but clads the exteriors with aluminum.

Windows and Doors in Factory-Built Structures

There are few special demands relating to windows and doors in the factory-built housing market, except with specialty units where, for example, high levels of insulation are required. In most cases, windows and doors are purchased in large volumes and consumer preferences currently reflect a preference for vinyl or vinyl-clad wood.

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[40] Adapted from *Window World* Spring 2003

At higher price points, and in many pre-cut homes, wood windows with more elaborate design offer a strong selling point to marketers. We did not identify any special needs for headers, beyond those discussed in general in the previous section for single-family new construction.

Other Millwork

Other millwork comprises a wide range of items including mouldings, staircases, flooring and numerous other applications where wood and other materials are required for non-structural construction and in appearance and finishing applications. Many of these products are now imported as ready-to-assemble (RTA) components.

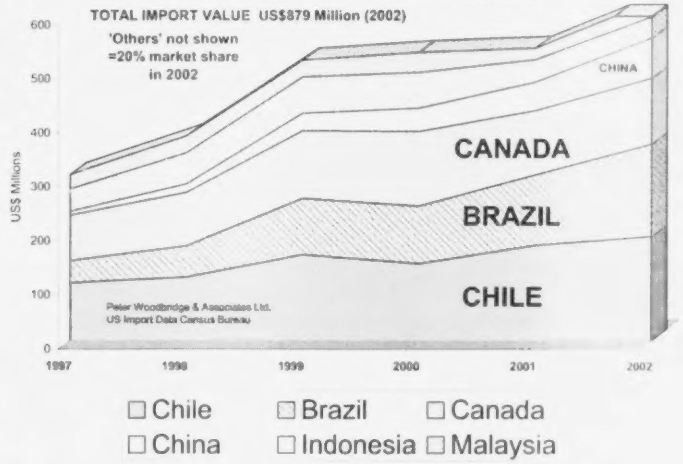
In the past, western species such as White Pine and Ponderosa Pine, have held a significant market share in many of these end-uses. Increasingly, solid wood has been displaced by fingerjoint lumber, MDF mouldings and non-wood materials, including composites. Many of these composites are made from wood waste combined with plastics.

US imports of other millwork in 2002 totaled US$879 million (Chart 59). This was an increase of over 70% from 1997. The top six import suppliers are shown in the chart. Chile is the largest supplier of millwork and mouldings to the US, shipping US$192 million in 2002 compared with US$106 million in 1997.

Brazil is the #2 supplier at present, with US$171million shipments to the US in 2002. This was up from US$41 million in 1997, or an increase of over 300% over the period. Canada was in #3 position, shipping US$122 million to the US in 2002. Canada's recent export sales performance in the US has shown very little growth over the past few years and currently is below the peak attained in the year 2000 (Chart 60).

Chart 60

Top 6 Suppliers of Other Millwork & Flooring to the United States



Peter Woodbridge & Associates Ltd.
US Import Data Census Bureau

From the point of view of examining Ontario's opportunities for other millwork sales to the US and Great Lakes specifically, it is worthwhile noting the fast rates of import market share growth being achieved by offshore suppliers.

Examples include China (US$74 million sales to the US in 2002, with a very fast growth rate), Brazil and Chile. Indonesia and Malaysia have been significant suppliers in the past, but their market share is growing comparatively slowly.

There are important strategic considerations for the Ontario industry as it continues to increase its exports to the US. There appear to be close working relationships, and ownership ties, between many firms in this business on both sides of the border. Ontario seems already to have a well defined role in the overall trade and is able to serve several high end niche markets in the Great Lakes.

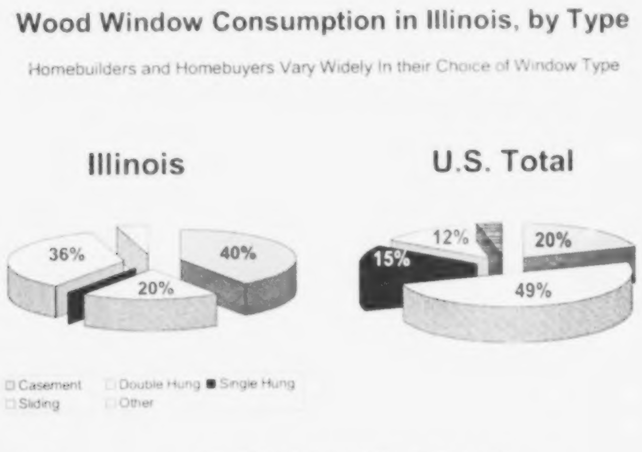
Apart for Canada's exchange rate advantage, it is not clear, however, what key drivers of further major capacity expansion exist in this business.

Demand for Wood Windows & Doors in the New Construction Market

In the new construction market, homebuilders and homebuyers vary widely in their choice of window type. The options vary according to price point of the home and reflect differences in climate and housing type (single family and multi-family). Chart 61 shows typical types of windows chosen in Illinois compared with the US average, in 2001.

In Illinois, there is a strong preference in single family new residential construction towards casement type windows. These accounted for 40% of the market. Sliding windows were the next most popular type, with a 36% market share in the state. Double hung windows, which are popular in the North East and South, accounted for just 1 in 5 windows installed in 2001.

Chart 61



Peter Woodbridge & Associates and NAHB Research Centre

In the United States overall, total consumption patterns show that double hung windows accounted for nearly half (49%) of all windows used in new residential construction. Casement windows accounted for 20% of overall consumption, in contrast to the popularity of this window type in Illinois. Single hung windows (15% of national consumption by type) are popular in new homes in many areas, while sliding windows accounted for just 12% of the US average in 2001.

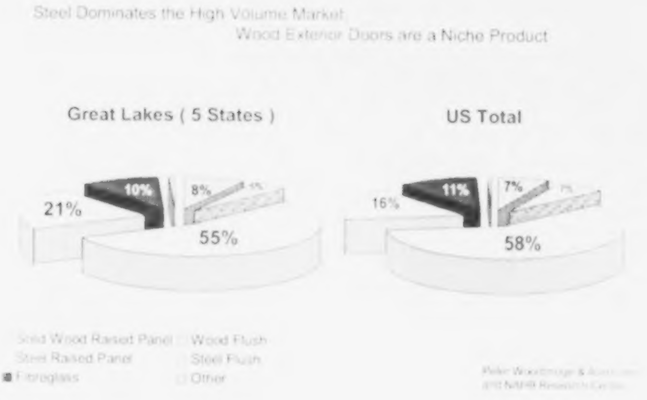
Marketing of windows to different areas of the US needs to reflect regional and local preferences and underscores the need for detailed market knowledge and a strong distribution network. The linkages created by Ontario wood window manufacturers in the US Great Lakes are an important part of effective sales and a source of competitiveness.

Exterior Doors

In contrast to the individuality found in the windows market, the types of exterior doors used in new homes are fairly standard throughout the United States. Chart 62 shows that the pattern of consumption across the Great Lakes market region is almost identical to that for the United States as a whole.

Chart 62

Exterior Doors: Choices are Fairly Standard Across the US



Peter Woodbridge & Associates and NAHB Research Center

Approximately 55% and 60% are steel raised panel doors in each case. Steel flush doors account for another 16% to 21%. 10% to 11% are fiberglass and between 17% and 18% are wood-based doors – either wood flush or solid wood raised panel. Ontario is a producer of several types of doors sold into residential markets, and produces some high-end wood doors for luxury homes.

Demand for Wood Windows & Doors in the Remodeling Market

The US$150 billion (annual sales) US remodeling market is a large consumer of wood windows and doors. Direct sales from large producers, such as Pella and Andersen, to big-box stores such as Home Depot and Lowes dominate the market for domestic products.

The large retailers and distributors serving the pro-dealerships also purchase sizeable volumes of supplies from offshore (notably interior doors), and these are capturing market share quite rapidly. However, the low unit cost of the US domestic industry generated by its very large scale, automated and very efficient plants results in domestic window suppliers dominating the retail window market.

The US Wood Windows Industry

The US Great Lakes is an important region in the production of wood windows and doors. Based on Census data[41], there were over 1400 establishments in the US with their primary

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[41] US Census Manufacturing – Industry Series 1997

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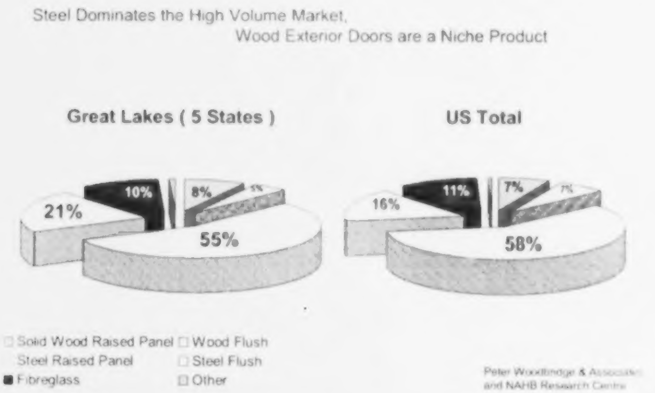

Peter Woodbridge & Associates and NAHB Research Centre

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The US Wood Windows Industry

The US Great Lakes is an important region in the production of wood windows and doors. Based on Census data[41], there were over 1400 establishments in the US with their primary manufacturing activity in wood windows and doors. They produced a total shipments value of $8.7 billion in 1997. There was consolidation among larger firms in the industry during subsequent years and by 2001, the total shipments value was US$11.3 billion, or an average increase of nearly 6% per year.

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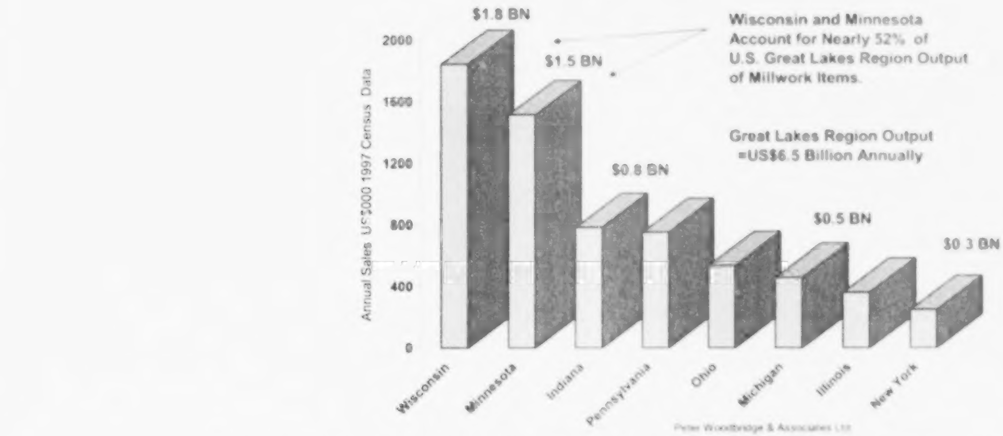
[41] US Census Manufacturing – Industry Series 1997.

Geographically, the wood windows and doors industry is represented in most states but is concentrated heavily in Wisconsin (#1 in the US), Minnesota (#2), Iowa (Pella), California, Texas and Oregon. Much of the high valued old growth species from the west that was used for wood windows and doors traditionally came from Oregon. This aspect of the industry has since declined, but the state is still the home of some leading manufacturers, such as Jeld-Wen .

Chart 63 shows millwork output in the Great Lakes and illustrates the dominance of Wisconsin and Minnesota. Together, these account for nearly 52% of millwork output from the region, valued in 1997 at over US$6.5 billion.

Chart 63

Millwork Output in U.S. Great Lakes



Peter Woodbridge & Associates Ltd

Throughout the US and Canada, one of the characteristics of the wood windows and doors business is that many of the manufacturers involved are private firms. Several are large global players. Volume 4 provides further details and examines the implications and future opportunities for Ontario's wood windows and doors industry.

The US Other Millwork Industry

The US Great Lakes region ranks well down the list as a manufacturing area for other millwork, including flooring.

Based on Census data, there were about 1450 establishments in the US involved in the manufacturing of these products in 1997. The largest producing states were California, Tennessee (oak flooring), North Carolina, Georgia, Virginia, Missouri and Oregon. Many of these are based traditionally on indigenous hardwoods or high value softwoods.

As an industry, the other millwork, mouldings and flooring business in the United States has not grown in shipments value at anything like the rate of the wood windows and doors sector. Much of the domestic growth in both sectors has been diverted to offshore suppliers, but the mouldings and flooring businesses within the US have suffered particularly badly due to imports.

Chart 64 compares the change in shipments value from domestic manufacturers over the period 1997-2001 for the two sectors. Only limited growth has taken place in shipments of other millwork from domestic suppliers within the US. With a peak in 2000, these rose from US$4.4 billion in 1997 to US$4.9 billion by 2001.

Increasingly, imported flooring is replacing traditional North American hardwoods such as oak.

New markets are being developed for a wide range of indigenous North American species, notably as wood flooring displaces carpeted floors in consumer preferences.

Maple, ash, alder and even western hemlock have been developed for this purpose. Even so, with the widespread availability of offshore supplies of solid hardwoods and engineered wood floors (EWF), usually at lower per square foot cost for materials than the domestic brands, the market share of imports seems set to climb.

Demand for Other Millwork and Flooring in Factory-Built Housing

The HUD-based manufactured homes industry is a significant consumer of mouldings and some basic millwork, but per floor usage rates for other millwork in total is significantly lower than for single family new construction.

Usage rates climb in concert with higher price points in HUD code housing and installed carpets are being displaced by laminated wood floors in many instances.

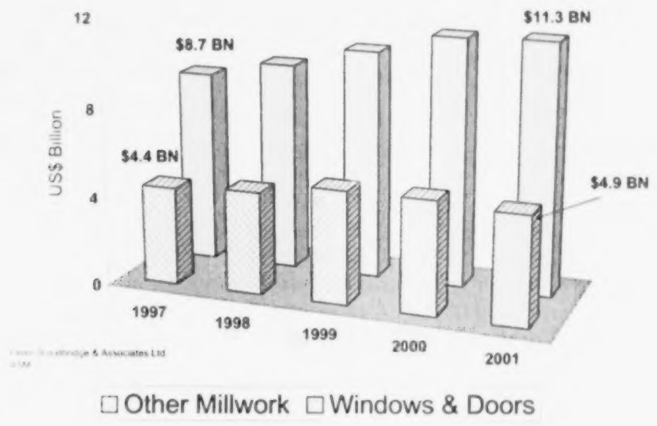
In conventional code factory-built two-storey housing, usage rates climb and can mirror those for starter homes and move-up homes in new residential construction.

Demand for Other Millwork in the Remodeling Market

The US remodeling market consumes significant volumes of other millwork annually. Home improvement centres and pro-dealers have done much to promote the availability and choice of high quality mouldings and interior woodwork for the consumer.

Chart 64

Growth in US Wood Window & Doors Production has Outstripped Production of Other Millwork



The Ontario Wood Window, Door and Other Millwork Industry

Ontario has a large and thriving industry producing these products, located in southern Ontario, and is well represented in several millwork products. For example, it is the home base of one of the world's largest door manufacturers, Masonite International Corporation, formerly Premdor (Mississauga, ON). The headquarters of the Royal Group of Technologies is a major supplier of mouldings. The group recently expanded its plant capacity at Woodbridge, ON. Alexandria Mouldings is also a significant producer, notably in MDF mouldings. Sauder is another Canadian player, but most of its production capacity growth is in the US.

Within Ontario, the millwork sector does not depend for its supplies on the province's wood producing industries. The same "disconnect" is evident in the US where millwork plant locations are no longer tied strongly to domestic and traditional wood sources (e.g. Ponderosa Pine in the West). Windows and doors producers use wood, but also use extensive volumes of non-wood materials (e.g. vinyl, fibre-glass, metal and composites). In these products, Ontario competes with some of the world's other largest and most efficient manufacturers located in the Great Lakes states and elsewhere which have their strength in extruded plastics and metals, along with distribution, and which increasingly source their wood needs from overseas.

Despite the province's strong connection with the "marquee" names outlined, most of the high volume production manufacturing capacity of these larger firms is located outside Ontario and outside Canada. Masonite, for example, operates 70 plants in twelve countries.

There are some plants in northern Ontario linked to Ontario's hardwood resources as well as recent technological innovation in OSB sub-flooring by Kruger at Longlac, ON ('Dricore') that can use domestic hardwood overlays.

Like many firms in the US, companies in the Canadian millwork industry tend to be either small, or very large with linkages to US operations (e.g. Royal Group and Royal Mouldings of Toronto). A large percentage have fewer than 50 employees due to the specialty and high-end niche markets they serve.

Hardwood Lumber

In Ontario, hardwood lumber is derived from deciduous species such as maple, birch, beech, aspen, ash and oak. Hardwoods are used in Ontario for pulp and papermaking, structural EWPs and lumber.

In its resource development policies on public lands, central Canada has tended to neglect and frequently disregard the potential value of many of its higher density hardwood species. In contrast, the hardwood industries based in the US North East and parts of Atlantic Canada are much further developed commercially.

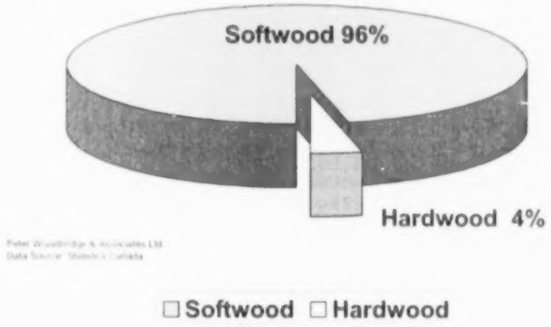
For most parts of Canada, until recently, the over-riding culture of utilization has been in favour of softwoods. This has been changing, notably in the use of aspen and other low density hardwoods for OSB. The TimberStrand mill at Kenora, Ontario is based on aspen. This situation historically has not served the wood windows, doors, mouldings and other millwork to advantage. Canada has consistently incurred a trade deficit in hardwood lumber (e.g. Ontario, in 2002).

Product certification Issues

Forest products certification (e.g. FSC, CSA, SFI) lies outside the scope of this report. However, this is an important commercial issue and may be a driver of future competitiveness and market access for Ontario's wood product manufacturers.

Chart 65

Hardwood Lumber Production in Ontario 2002



Peter Woodbridge & Associates Ltd
Data Source: Statistics Canada

The Phase I study pointed out that in Europe, while industrial and non-structural use dominates the demand for softwood lumber, the European furniture and millwork industries dominate demand for primary hardwood lumber. It also noted that value-added manufacturers are a key market for all primary hardwood mills.

Chart 65 shows the estimated production of softwood and hardwood lumber. Most of the current uses of Ontario hardwoods today are for structural end-uses. There is a significant "disconnect" between the Ontario forest industry, on the one hand, and the province's wood windows, doors, mouldings and other millwork industries.

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Group C

Market Opportunities in Factory-Built Housing

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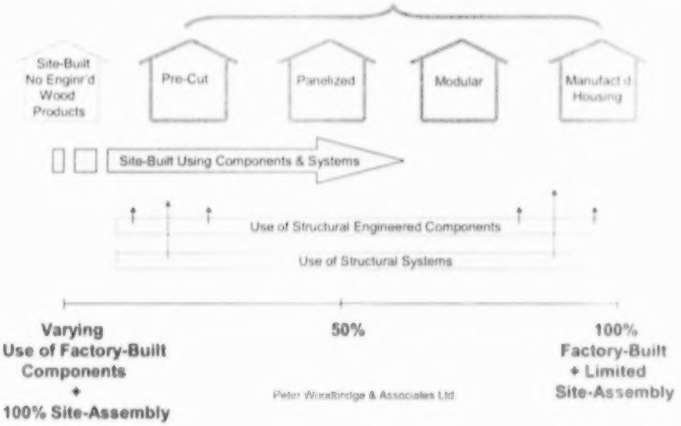
Group C. Market Opportunities in Factory-Built Housing

The factory-built housing industry in North America comprises two principal product groups: "HUD-Code" manufactured homes and other prefabricated homes, comprising pre-cut, panelized and modular (Chart 66). Both of the main product types involve production of the majority of a home in the controlled environment of a manufacturing plant, and transported in one or more sections to a site.

Both groups use a variety and substantial volume of primary and engineered wood products and building components. Ontario supplies softwood lumber, OSB, engineered wood product, building components and other wood products to this industry.

Chart 66

Products Manufactured by the Factory-Built Housing Industry


Site-Built No Enginr'd Wood Products
Pre-Cut
Panelized
Modular
Manufact'd Housing
Site-Built Using Components & Systems
Use of Structural Engineered Components
Use of Structural Systems
Varying Use of Factory-Built Components + 100% Site-Assembly
50%
100% Factory-Built + Limited Site-Assembly

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HUD-code homes (formerly known as mobile homes, now referred to as manufactured homes) are built to the Manufactured Home Construction and Safety Standards and display a red certification label on the exterior of each transportable section. All HUD-code sections are built onto a permanent metal chassis. HUD-code homes can be installed on leased land in communities or on permanent foundations on private land.

Prefabricated homes can be modular, panelized or pre-cut. This type of factory-built home is built to local or state building codes and usually is placed on a permanent foundation, unlike traditional mobile homes. Owners of prefabricated homes usually own the land on which their homes are located. Three major prefabricated technologies include:

- **Modular Homes**: Factory-built homes that are built to the state or local building code where the home will be located. Modular homes begin as components and are designed, engineered and assembled in a factory and then transported in "3-dimensional" form to the site and installed on a permanent foundation.

- **Panelized Homes**: Factory-built homes that are made up of large, factory-made panels that will make up a whole wall and include windows, doors, wiring and outside siding. These panels are then transported to the site transported as 'kits' "2-dimensional" on a flatbed truck and assembled on site. These panels are usually 8 feet high and up to 16 feet long. The panels are designed to be installed immediately, along with the roof, and be completed within a few days of arrival.

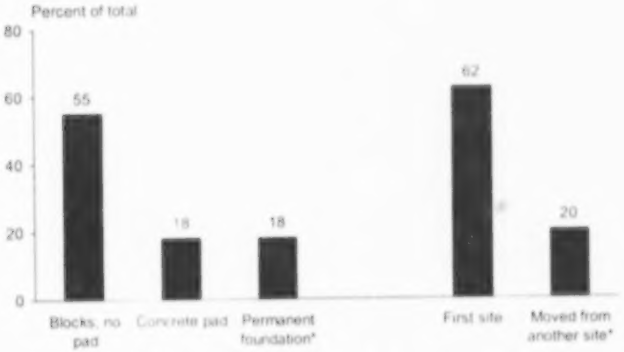
- **Pre-Cut Homes:** Factory-built homes whose building materials are factory-cut to design specifications and transported to the site to be assembled. Some types of pre-cut homes include kit, log and dome homes. These homes must meet local, state or regional building codes.

While pre-cut and panelized housing production is a small but growing niche in the new housing construction sector, HUD-code manufacturing and state-code modular housing production represents the vast majority of housing production from a factory setting. Traditionally, HUD-code homes are placed on concrete blocks and are rarely moved from their initial sites. According to the American Housing Survey, over half of occupied manufactured homes in 2001 were placed on concrete blocks with no permanent foundation or concrete pad, but two-thirds of homes were still on their original site.

Slightly fewer than one-in-five occupied manufactured homes are placed on permanent foundations (Chart 67). However, as presented in this report, the current trend is decidedly toward increased permanent placements – one of the factors which we believe will drive up demand for this product in the years ahead.

Chart 67

Characteristics of Site Placement, Manufactured Homes, 2001



* Remainder unknown or not reported

Source: Clayton Research based on data from U.S. Census Bureau's American Housing Survey

How Significant are Factory-Built Technologies?

It is widely known that factory-built housing dominates total new housing supply in countries such as Japan and Sweden, where it accounts for 75%-80% of new single family home construction. In other countries too, such as Switzerland (16% of single family starts in 2002), Australia and the UK, factory-built methods are gaining market share. The shortage of skilled site-labour and trades people (carpenters, framers, bricklayers, electricians) are forcing these changes.

How significant are factory-built methods in the United States?

Schuler and Adair[42] have estimated that site-built, or "stick-built", accounted for nearly 69% of US conventional housing starts (i.e. excluding manufactured homes) in 2001, down from 80% in 1997. Over that period, factory-built panelized wood walls increased in market share from 7% to 15%, while modular (excluding HUD) declined slightly in volume and percentage market share from 3% to 2%. Thus, the decline in stick-built (within conventional starts) was more than offset by panelization methods.

Schuler and Adair note that concrete and steel are increasing their market share and that the "wood loss" due to this growth is the equivalent of about 15,000 starts per year. Perez[43] concludes that panelization also is gaining in popularity because the quality of these components has improved vastly.

Pulte[44] notes that the ability to ensure precise dimensions of building foundations, achieved in some cases by factory-built concrete foundations, avoids errors on site that have to be corrected through site-based adjustments in the framing. The result is a 'true' structure that facilitates system building throughout. In our view, this approach is fundamental to realizing the potential cost and quality gains that lie in prospect for factory-built vs. site-built construction methods.

Placement of HUD-Code Manufactured Homes

Placements are a measure of demand for factory-built houses and are counted when the new unit is placed on a temporary or permanent foundation. The placement of HUD code manufactured houses across the United States has varied considerably over the past three decades, most recently falling to approximately 170,000 units placed in 2002, and to an annualized 130,000 units in the first quarter of 2003. These recent placements are down from the peak of 375,000 units in 1998 (Chart 68).

Moreover, manufactured home placements as a share of all housing units have also declined in the past four years. At its peak in 1998, HUD placements represented over 23% of all housing starts in the U.S., a proportion of which fell to 10 percent in 2002, and under 8% in the first quarter of 2003. HUD-code placements in 2002 reached a 40-year low.

In contrast, the consumption of factory-built homes other than HUD code has been rising. The number of prefabricated homes shipped from U.S. producers rose from around 60,000 units in the early 1990's to nearly 80,000 units in 2002. On a seasonally adjusted basis, the estimated number shipped in Q1 2003 was as high as 84,000 – a rise of 6% over 2002.

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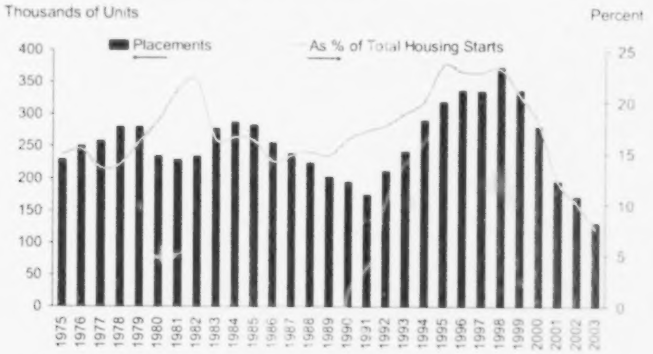
[42] Demographics. the Housing market and Demand for Building Materials. Al Schuler and Craig Adair. Forest Products Journal Vol 53. No 5. (May 2003).
[43] Cited in Schuler and Adair, ibid.
[44] Conversation with Alan Laing, V-P Supply Chain & Customer Satisfaction. Pulte Homes.

Chart 68

Placement of New HUD-Code Manufactured Housing Units, U.S., 1975-2003



* January-March, seasonally adjusted at annual rate
Source: Clayton Research based on data from HUD

Prefabricated product, mostly state-code modular sections, is becoming a more prevalent component of overall factory-built production – rising from about 16% in the early 1990's to between 30%-40% in recent months based on Clayton Research Associates calculations.

Consumption of Factory-Built Homes

Factory-built housing units in the U.S. are a fairly substantial component of new housing production, accounting for 1 out of every 5 new housing units in the 1990s.

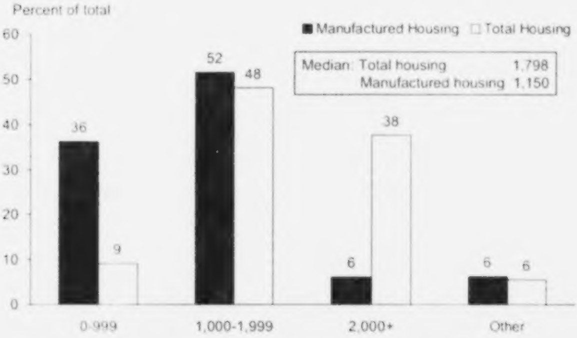
- Manufactured housing placements have ranged from a low of 174,000 in 1991 to 374,000 units in 1998, with an annual average of 282,000 units in the 1990-2000 period. Since 1998, there has been a significant decline in manufactured housing consumption in the U.S., both in absolute and in relative terms.
- In addition, an estimated annual average of about 70,000 prefabricated housing units, mostly state-code modular sections, were placed across the US through the period 1990-2000.

Traditionally, factory-built homes, particularly HUD code homes, have garnered some of their appeal due to their affordability relative to comparable site-built homes. Some of the decline in factory-built demand (as evidenced by the decline in manufactured home placements since 1998) is due to improved affordability across all segments of the housing market in recent years.

This is connected to a strong U.S. economy (up until 2001) and low interest rates (which have persisted through to the present), which have allowed many would-be factory-built home consumers to buy site-built homes. As a result, the overall housing market has been very strong recently, while the factory-built home segment has been somewhat weaker.

Chart 69

Square Footage as Share of Total Owner Occupied Housing Units, 2001



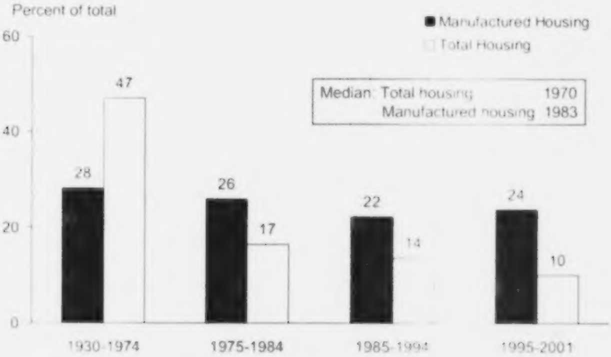
Source: Clayton Research based on data from U.S. Census Bureau's American Housing Survey

Approximately half of occupied manufactured homes across the U.S. in 2001 were between 1,000 and 2,000 square feet in floor space. This proportion is similar to all types of housing, of which just under half fall into this category (Chart 69). However, the bulk of the remainder of the factory-built stock is smaller than 1,000 square feet in floor space, whereas across all types of ownership housing, it is larger than 2,000 square feet. Overall, owner-occupied homes in the US tend to be about 1,800 square feet, whereas owner-occupied factory-built homes are closer to 1,150 square feet.

Overall the stock of manufactured homes in the US tends to be newer than across all housing units. Almost 50 percent of occupied manufactured homes in 2001 were built after 1985 compared to about 25 percent of all occupied homes.

Chart 70

Year Structure Built as Share of Total Housing Units, 2001



Source: Clayton Research based on data from U.S. Census Bureau's American Housing Survey

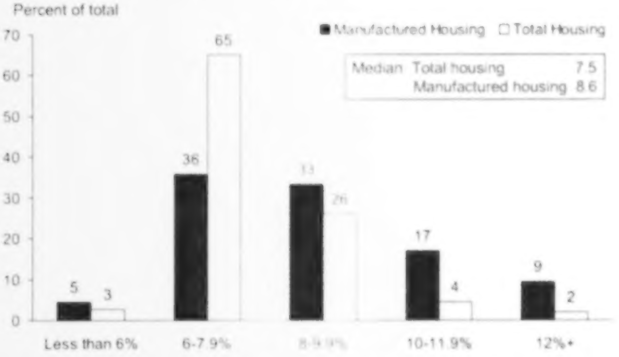
Recent Declines in Placements are Due to the Economy and Financial Issues
Demand for new HUD-code homes has been particularly hard hit by recent events in the financial sector. Traditionally, HUD-code home purchases are financed with a chattel mortgage – a personal property loan.

The interest rate on this type of financing can be 2-8 percentage points higher than for a real property mortgage (financing which is available to a buyer of a site-built home, or a factory-built home placed on a permanent foundation on private land). Several recent developments have dried up the available financing for chattel mortgages on HUD-code homes:

- Interest rates of all types have declined in recent years. As a result, the spread (or difference) between a real property mortgage rate and a chattel mortgage rate is relatively higher – increasing the relative attractiveness of site-built housing. In 2001, according to the American Housing Survey, nearly 60 percent of manufactured home owners were paying 8% or above on their mortgages – about twice the proportion of owners across all types of housing (Chart 71).

Chart 71

Current Interest Rate as Share of Total Owner Households with Mortgage, 2001



Source: Clayton Research based on data from U.S. Census Bureau's American Housing Survey

- In December 2002, Conseco Finance, the nation's largest lender to the HUD-code home sector with over $25 billion dollars worth of outstanding loans – filed for Chapter 11 bankruptcy. This move followed several years of poorly performing loan portfolios which had roots in a lacklustre US economy in 2001 and 2002, on top of several years of over-aggressive lending to buyers with questionable credit (both Conseco, and its predecessor Green Tree Financial). Other lenders are viewing the Conseco experience as a lesson, and chattel mortgage finance for HUD-code homes has become relatively scarce. The mobile home portfolio has recently (June 2003) been sold to another company, which will likely bring some stability to the situation.

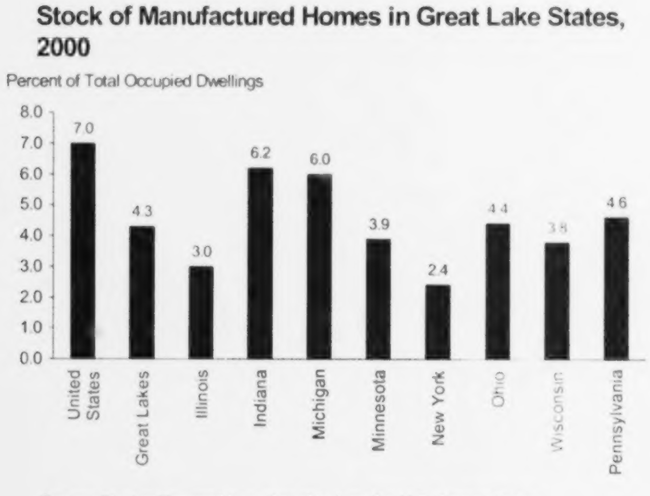
- In part due to the Conseco situation, and in part to general economic malaise in the U.S. since 2001, the number of HUD-code chattel mortgage defaults has risen sharply. This has had the effect of further constricting the amount of finance available for new buyers, and has also increased the number of resale units on the market as financial institutions attempt to liquidate repossessed housing units. Both of these effects have reduced the demand for newly fabricated HUD-code housing units.

It will likely take more time to work through the backlog of repossessed homes on the resale market, and for confidence to return to the chattel mortgage sector in the U.S. In the meantime, it is expected that the demand for HUD-code units destined for rented land will remain relatively soft.

Demand for Factory-Built homes in Great Lakes States Lags the National Average
Consumption of manufactured housing in the Great Lakes States is somewhat weaker than across the U.S. as a whole, according to the distribution of households by dwelling type in the 2000 Census (Chart 72).

- All the states in the region have consumption rates below the national average of 7% of total housing.
- The Great Lakes region falls significantly below the Southern and Mountain regions of the U.S. – the two regions of highest consumption of manufactured housing.
- Michigan is the only Great Lakes state to be listed as one of the top 10 states (which contain 50% of all mobile units in the country). Michigan houses 228,000 households in mobile dwelling units (3.1% of all housing). Other states range from New York at 2.4% of total housing to Indiana, with the highest proportion in the region, at 6.2%.

Chart 72



Source: Clayton Research based on data from the U.S. Census Bureau

Trends in Factory-Built Housing

As technology advances, changes have been made to the features and materials used in most factory-built homes. Notwithstanding the cyclical decline in product demand since 1998, these factors are setting the stage for long-term growth in the use and acceptance of factory-built housing in U.S. markets.

Consumer Acceptance is Rising

In general, factory-built homes are becoming more accepted among home buyers because:

- Quality and aesthetic characteristics are now standard in these homes. For example, more spacious floor plans, vaulted or tray ceilings, drywall throughout, a variety of exterior siding, walk-in closets, fireplaces, brand-name appliances, pitched roofs with shingles, larger eves and gabled ends, and various options that are customized specifically to meet the needs of the consumer.
- In many cases, today's factory-built homes no longer have the "house-in-a-box" image they used to have, and this fact is being recognized by potential home-buyers. The new look of modular factory-built homes including second storeys, cape-cod gables, and various portico treatments have all helped to make this type of home indistinguishable from a site-built home.
- The characteristic look of "mobile homes" has disappeared from the industry. Virtually all HUD code homes are now built with steep, peaked roofs, rather than the flat or "bow" roofs of the industry 30 years ago. The increased use of multi-section placements allows a home owner to assemble dwellings with wings, setbacks and other such architectural features.
- Well installed factory-built homes are indistinguishable from "site-built" homes from a visual perspective.
- Factory-built home owners tend to be very satisfied with their homes. In the Census Bureau's 2001 American Housing Survey, about two-thirds of factory-built homeowners were highly satisfied with their homes – a proportion similar to satisfaction across all housing types.

Integration with site builders is rising

The factory-built housing industry is becoming more integrated with traditional site-builders.

- Due in part to the concentrated efforts of larger factory builders such as Champion Enterprises, which is steadily growing its "Genesis" operations which customize homes and components directly to builders and developers, the builder channel continues to develop. Champion sold 3,100 homes through their Genesis channel in 2002 – about 11% of total sales, and up 15 percent over 2001.
- Most of the factory homebuilders surveyed in this study actively pursue relationships with builders and developers, and on average, about 15-25 percent of recent sales were direct to builders or developers.
- Use of factory-built homes or components allows site builders to lower their unit costs substantially. In the 1990s, construction costs per square foot (excluding land development and below-grade excavation) were roughly 30-50% lower for factory-built components than their equivalent site-built product. While builders in the late 1990s were

generally able to compete due to the affordability of their product (connected with low interest rates), as rates rise through the forecast period, more builders are expected to seek options such as prefabrication to continue to drive costs out of their production and preserve their margins.

- Building code harmonization will help promote prefabricated product. Factory home builders who produce modular or other prefabricated product (i.e., non HUD code) are required to have certification from each state in which they sell. A movement underway to harmonize building codes across multiple states will reduce these costs, making modular homes even more competitive against site-built. At present, 43 states (and the Department of Defense) adhere to the International Building Code.

Modular Home Demand is Rising

A shift within the factory-built industry away from HUD-code and toward prefabricated homes will continue.

- Through the 1990's, prefabricated homes represented about one-in-six factory-built homes produced in the U.S. In recent years, it is clear that this ratio is rising. Among the firms surveyed in this study, most traditional HUD producers also produced modular product. On average, about 30-40 percent of production from these firms is modular.
- From a production standpoint, factory home builders can easily shift from HUD to modular. Most of the firms surveyed in this study produce both product lines sometimes on the same production line using mostly the same production techniques. This production flexibility provides an easy transition into the modular industry for existing HUD producers whose markets may temporarily be sour.
- As the modular product is better suited for installation on permanent foundations, there is greater acceptance of this product among financial institutions. In many cases, purchasers of HUD code homes resort to chattel financing, and an elevated wave of defaults in the late 1990s and a subsequent credit crunch are partially to blame for recent declines in HUD code demand. There is a greater availability of more secure financing for modular product.

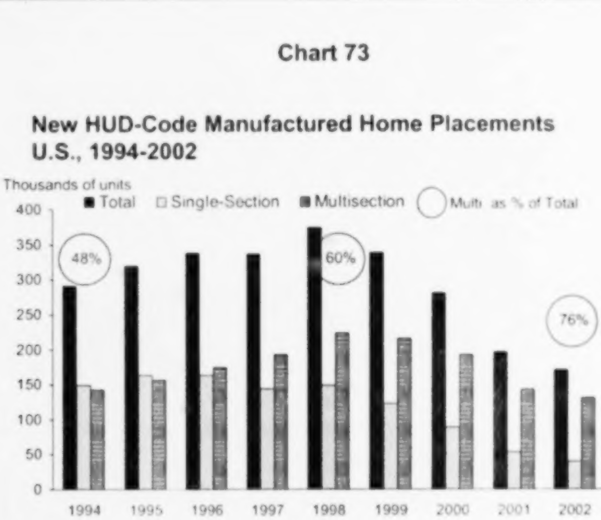
Overall, the factory-built housing sector is in transition across the US and in the Great Lakes States. There are promising demand and supply side factors which will continue to see a boost to the sector, but the composition of that sector is likely to continue to shift.

Multi-Section Demand is Rising

Multi-section units have been steadily growing as a share of the total HUD code shipments over the past few years (Chart 73). Even though total shipments have been on the decline since 1998, multi-section units have been increasing in relation to the total. Thus, shipment values have not declined by as much as the "headline" number of homes shipped. This switch to multi-section units is indicative of a greater focus of the manufactured housing industry on "permanent" housing units.

Chart 73

**New HUD-Code Manufactured Home Placements
U.S., 1994-2002**



Source: Clayton Research based on data from the US Census Bureau

A majority of the new multi-section homes are double-section. In 2002, 130,900 multi-section homes were in place, which included 4,200 homes with three or more sections.

Prospects for Factory-Built Housing

While the industry continues to face its challenges coping with issues that have dampened production volumes since the mid-1990s, the fundamentals remain in place for a rebound in growth in the years ahead, and a gradually increasing presence of factory-built housing within the new home industry in the US over the decades ahead.

There are several factors which suggest that factory-built housing will capture larger shares of total new housing activity in the U.S. over the next two decades, including:

- The continued ability of the factory-built sector to drive costs out of the production process and compete head-to-head with the site-built sector;
- The increased presence of factory-built product use within the site-built sector through partnership deals between factory-builders and site builders and developers;
- The increased presence of factory-built product in multi-family projects;
- The increased presence of land-house deals which is eroding traditional stereotypes about the product and moving the product up-market (in terms of demographics);
- The superior and more stable financing sources available to the land-house deal, which will provide greater stability to the factory-built sector through finance-cycles;

However, there remain cautionary factors which present growth risks for this sector. The ability of the industry to address these risks will be critical in order to realize its potential growth. These include:

- As the industry continues to move its product up-market, it risks abandoning its traditional niche in the housing industry. As manufacturers move to expand their presence in the mid-market product, including modular homes, "drywall" homes[45] and multi-section homes, there is a risk that the supply of single-section HUD-code units priced in the under-$25,000 range will dry up. Depending on the ultimate success of the industry to compete more head-to-head with the site-built sector in the middle and upper markets, the factory-built sector risks losing its presence in both markets.

- Loss of rental communities. There are some 50,000 manufactured home rental communities across the U.S. However, there is evidence that owners of these communities are moving to shift toward land-house deal developments. The risks going forward to the industry is that there will be less rental space available for the traditional single-section affordable manufactured homes, and thus, demand for this product will also decline.

Nationwide demand in the U.S. for factory-built housing, including HUD-Code manufactured homes (single-section and multi-section) and panelized, modular and pre-cut homes, is predicted to increase to 440,000 units annually by 2010 and over half a million units annually by 2020. Prefabricated housing is expected to outpace site-built homes over the forecast period, accounting for nearly 8 percent of all housing starts by 2020 compared with about 4 percent recently.

The cost advantages of factory production of houses, including better labour productivity, improved scheduling, bulk purchasing of materials, lower waste disposal and better recycling practices and insulation from weather related delays, will push up U.S. demand for factory-built homes in the future.

According to NAREIT (the National Association of Real Estate Investment Trusts) the future of the factory-built housing industry looks promising:

- The reduced production and shipments of new housing units have alleviated some of the excess inventory problems.
- Tighter credit standards have improved credit performance, which should reduce the number of consumers defaulting on their loans in the future.

This is expected to move the factory-built housing sector back to a profitable position within a couple of years. Future demand will be driven by improving the quality of factory-built homes, better overall consumer image of the products available, and better affordability compared to site-built homes. The aging of the population as well as the baby boom cohort reaching retirement age is likely to increase demand for factory-built homes.

Industry Structure

At year-end 2002, there were 66 corporations producing manufactured homes (HUD-code and often modular from adjacent lines within the same plant) out of 235 plants across the United States. There has been considerable consolidation in the industry through the 1990's, with the number of corporations declining, mostly through amalgamations from 100 in 1990 to 70 firms by 2001.

The total number of plants in operation has varied largely with market conditions, with the number of plants rising from 216 in 1991 to 337 in 1997, then falling again to 235 in 2002 (Chart 74).

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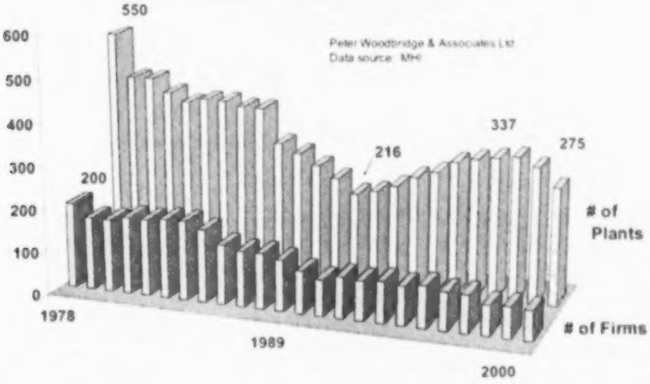
[45] Another indication of the up-marketing of factory-built homes is the proportion which are built with finished drywall interior walls, as opposed to the traditional vinyl-coated wall board or wall paneling more typical of lower-end manufactured homes.

Chart 74

Manufactured Homes: # of Firms and Plants in Operation in the US



Peter Woodbridge & Associates Ltd
Data source: MHI

The structure of the industry is a significant driver of regional competitiveness, notably in terms of unit production costs and the extent to which national dealership-networks can dominate regional and national markets. In Volume 4, *the Opportunities Report,* we discuss in the context of Ontario and the US Great Lakes states how this can affect the competitiveness of smaller, single-plant manufactured housing producers and can force them to focus solely on custom markets.

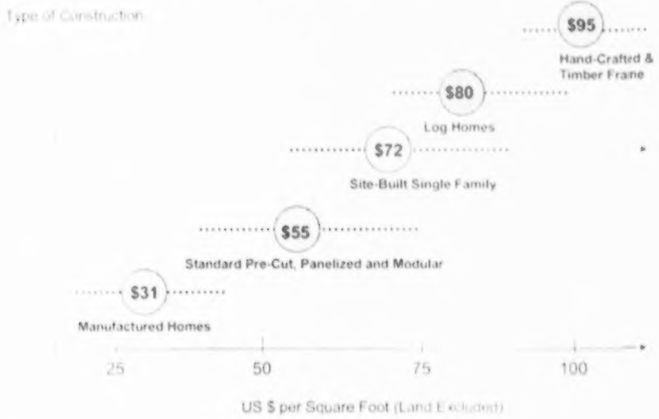
Technology and Building Products

Construction cost per square foot for a new factory-built home compared with site-built varies. Except for customized factory-built, which serves a higher price point in the market, typical averages indicate that factory-built can vary between 25% and 55% less than a comparable site-built home. In spite of this, the homes are often sounder than many site-built dwellings and are becoming indistinguishable from site-built homes as a diversity of profiles and designs hit the market.

Chart 75 provides a comparison between average selling price points for various types of housing in the United States. Site-built single family housing averaged US$72 per square foot in 2001, but had a wide range of pricing from around US$50 per square foot to highs well in excess of US$150 per square foot. In contrast, manufactured homes averaged US$31 per square foot and other factory-built single family homes averaged US$55 per square foot.

Chart 75

'Average' Price Points for New Homes in the United States



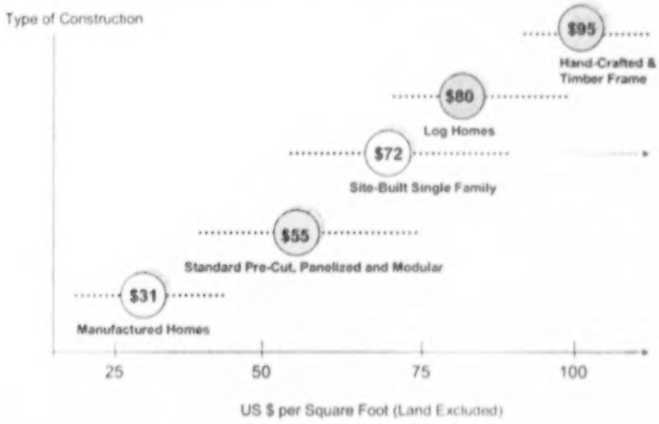
Peter Woodbridge & Associates Ltd.

The key to the affordability of factory-built homes is the buying power of large-scale factory builders, and the efficiencies of the factory process. These costs are driven by the following factors:

- All aspects of the construction process are controlled;
- Weather, trades delays, and other problems which can plague productivity on a construction site do not interfere with construction and cause delays;
- All technicians, craftsmen and assemblers work as a team and are professionally supervised;
- Inventory is better controlled and materials are protected from theft and weather-related damage;
- Building inspections are carried out in-plant. The factory seal precludes the need for usually more expensive on-site inspections.
- Blending of traditional wood frame with engineered wood, and the ability to move the job through the materials storage areas, reduces overall costs.
- Significant efficiencies can be achieved with automated setting of large sections of drywall (avoiding the need for tape), optimizing the use of foam as adhesive and using vacuum sanders.
- The factory setting can improve the performance of certain materials – such as the use of gas-fired heaters to assist in curing the asphalt on roofing shingles;
- The use of stations along the production line ensure that specialized labour, machinery and tools are continuously employed on specialized tasks.

Chart 75

'Average' Price Points for New Homes in the United States



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- The factory setting can improve the performance of certain materials – such as the use of gas-fired heaters to assist in curing the asphalt on roofing shingles;
- The use of stations along the production line ensure that specialized labour, machinery and tools are continuously employed on specialized tasks;

- Factory-built housing producers can access bulk purchasing of construction materials, finishes and appliances for additional savings to the home-buyer;
- Factory builders are able to save time and gain efficiencies by bulk production of major components like interior wall sections. Some builders have developed innovative techniques, such as foam-adhering drywall to interior stud walls (a completely screw-less procedure);
- Large jigs are used for the assembly of floor, wall and roof components which speed up the assembly process and avoid the sort of injuries that can occur on construction sites as workers clamber about on unfinished frames;
- Large-scale use of pneumatic tooling linked to central compressors save on time, fuel and electricity; and
- Costs of interim construction financing is significantly reduced or even eliminated, and there are high quality control procedures in place.

Building materials used in factory-built homes today are, in many cases, the same as those used in site-built homes. Whether HUD-code or modular (state code), the same precautions are taken when building factory-built homes, and they are engineered for wind safety and energy efficiency regulations in the region where they are sold. There are many federal safety laws applicable to factory-built homes, such as smoke detectors, escape windows, and combustible materials.

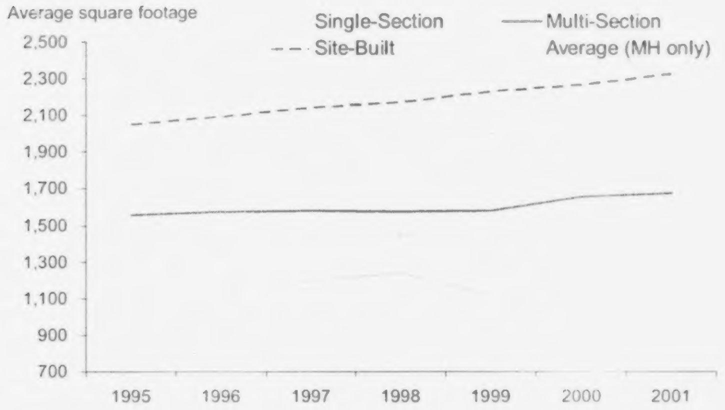
Wood is a Dominant Building Material in Factory-Built Homes
The residential factory-built sector is very wood-products focused. Trends in wood usage in this sector may be diverging from the site-built sector. There are a number of areas in which wood's traditional role in residential construction is being supplanted by alternative building materials such as light-weight steel studs, above-grade concrete walls and floor systems (particularly using insulated concrete forms (ICFs) and increased use of vinyl in millwork, exterior decking and other traditional wood-product applications.

In the factory-built sector, by contrast, construction practice has taken a significant shift over the past two or three decades from a product which in many respects resembled travel-trailers, including the use of metal frameworks, siding and roofing, to a product which is virtually indistinguishable from traditional wood-built site-built housing. This includes the use of wood wall studs (both interior and exterior) wood rafters and trusses, wood floor systems and wood cabinetry.

The apparent net usage of wood products in a typical factory-built home is only modestly on the rise despite the increasing size of the typical factory-built home. This has remained much the same over the past 6 years from 1,345 square feet in 1995 to 1,388 square feet in 2001(chart 76).

Chart 76

Average Square Footage of Manufactured Homes vs. Site-Built Homes



Source: Clayton Research based on data from the Manufactured Housing Institute

There has been a pronounced upward trend in the sizes of site-built homes compared to factory-built homes. In 1995, the average site-built home was just over 2,000 average square feet according to the Manufactured Housing Institute (MHI). In 2001, it was over 2,300 average square feet – a 13 percent increase. This is compared to a 15 percent increase in size in average factory-built homes.

On the basis of the factories surveyed in this study, the apparent usage of wood products in a 2,000 square foot factory-built home is about 12,700 board feet of dimensional lumber and additional 7,000 board feet of panel product. This is somewhat lower than estimates of lumber usage in site built homes produced by NAHB carried out in the early 1990s – which may be largely due to the reduced amount of waste lumber in the construction process.

Factory-built homes are getting larger and increasing in presence in the overall industry, so the apparent usage of wood products is likely to rise in the years ahead for factory-built, at the same time as competition from alternative building materials is likely to erode the apparent usage of wood products among site-built homes.

Use of Value-Added Wood Products in Factory-Built Housing

The use of value-added wood products in factory-built housing varies considerably between manufacturers. In addition to OSB, value-added products include engineered products (wood I-Joists, TimberStrand, floor and roof trusses) and millwork (wood windows and doors).

The greatest use of value-added wood products in the manufactured housing sector is panel products. OSB use is extremely common, especially as roof sheathing, exterior wall sheathing (generally 7/16") and, in some cases, floor sheathing.

OSB is used as spacers in assembled doors and window headers, backers for drywall at sheet seams, etc. OSB is the preferred sheathing on roofing and exterior wall sheathing because of the quality of its strength rating. The stresses that the framing undergoes during transportation is a particular concern in these homes – particularly the drywall homes.

Producers are happy with the ability of OSB to withstand that stress. In our field research, most producers were generally happy with OSB, when asked. The only complaints related to the price.

Other panel products that we observed to be in common use include:

- ¼ laminated panel stock was used by a couple of producers on interior walls between the drywall and studs. This ensured a stiffer wall, and helped avoid drywall cracking during shipping;
- MDF and particleboard, along with plywood, were all in use as floor sheathing by various manufacturers. One company, manufacturing a higher end product, ensured a more solid flooring by employing a double sheathing upon joists: a foundation layer of 7/16 OSB, then topped by 1/2 inch particleboard, adhered and nailed together.

Engineered roof trusses are used on virtually every manufactured home. The major innovation in this field has been the hinged truss, which allows producers to incorporate steeper pitches, but hinged the roof down for transportation in order to maintain roadway guidelines.

Engineered floor systems are used widely among many factory builders, but this varies between plants and price points being served.

Some producers employ a system of dimensional floor joists on LVL stringers for additional strength. Producers who use open web trusses in modular homes valued the ability to run heating and plumbing through the joist, thus avoiding the need for a duct belly below the floor. HUD homes have a natural belly in the chassis, reducing the need in this regard.

Several higher end producers used I-Joists, depending on the cost differential with dimension lumber. Generally, the unique feature of the I-Joist is its ability to span larger open sections, which is making this a product of increasing popularity among site-builders who are aiming to create homes with large open spaces. The factory-built home section is limited to 16 feet due to roadway regulations, so no floor is large enough in width to warrant the superior spanning qualities of an I-Joist. Even so, some manufactured home and pre-cut and modular producers favour them for dimensional stability.

Fingerjoint Lumber Use

There is considerable use of fingerjointed lumber in the manufactured home industry. At least half of the producers surveyed used fingerjointed lumber – usually 2X3s – for interior partition walls. Fingerjointed lumber was also used in load bearing applications such as exterior walls or around doors and windows.

Users of fingerjointed lumber valued its dimensional stability, consistency and reliability *in situ*. Also, they valued the reduced waste from the move from solid dimension. Some producers commented that waste among pallets of 2X3 and 2X4 dimensional lumber would be upwards to 30% - generally from pieces which were too crooked for use. In addition, most producers mentioned moisture content in dimensional lumber as a particular issue, especially since most of these operations are set up to receive supply "just in time" for production – so there is little time to allow stock to dry on site.

Users of fingerjointed lumber valued its dry and ready-to-use quality. Those manufacturers who did not use fingerjointed lumber generally either felt that its benefits would not warrant the additional cost, or felt that "something new" might be questioned by the customer. This suggests the need for better promotion and dispersion of product information by fingerjoint producers.

TimberStrand posts are employed by some producers at large openings in the marriage wall to help bear the load of the ridge beam. Generally, these are not used extensively by HUD code builders even though site builders extensively use this type of product for load-bearing headers and other applications where code requires a doubling up of dimensional lumber.

The use of ¼" laminated panel stock behind the drywall on the marriage wall is used to give rigidity to the wall and avoid drywall cracks in transit.

Laminated timbers were used in most of the manufactured homes surveyed. The most common use of a laminated timber was as the ridge beam above the marriage wall of a multi-section home. Usually this was an LVL beam. Some producers used LVL timbers as floor stringers on modular units. One producer used a laminated 2X3 stock for interior walls.

Several producers offer some models with high-end interior finishes, including extensive use of hardwood cabinetry, trim and other features. Many homes include crafted oak beam finishes, extensive cabinetry design and use of solid oak paneling above the pass-throughs.

Materials Procurement

Factory-built housing producers are generally operating within a highly competitive structure, producing a low-cost affordable product. Without exception, all of the producers that were surveyed in connection with this study emphasized the need to be cost-effective in their procurement. Nonetheless, a number of different procurement strategies appear to have emerged amongst the different companies operating in this industry:

- Most producers make at least some use of wholesale distributors of building materials. These distributors are often located locally, and have a sufficient distribution network to keep supplies reliably delivered to the various plants in the area. Most plants operate on a just-in-time framework for major materials, and tend to keep very little stock warehoused on site;

- Some producers discussed the long-term relationships that they have with wholesale or primary suppliers, sometimes going back for decades. Local wholesale suppliers are able, it seems, to adapt to the needs of the producers through particular means. Some suppliers store dimensional lumber in a warehouse for customers one month in advance, in order that the moisture content would be low when delivered and brought on line;

- Large-scale producers, such as Fleetwood, make use of corporate-owned suppliers for many products. In both the Fleetwood plant, and the Champion plant that we surveyed, however, it was clear that that local plants have a fairly wide discretion to procure outside of the corporate channels where price, timing or quality are issues;

- Some producers have engaged in purchasing or establishing subsidiaries to produce components. One producer had purchased an independent cabinet shop, for example, to avoid purchasing cabinets on the open market and keep better control over inventory and delivery;

- Most producers indicated that their procurement contracts were often reviewed for adherence to cost, timeliness and quality objectives, and that new and existing procurement needs were periodically placed on open tender in order to support the bottom line;

- Some companies procured dimensional lumber and laminated stock directly from producers;
- Engineered wood trusses were procured from local truss producers. The timeliness of delivery, and the ability to produce custom specifications on tight time frames, were qualities that factory builders felt local truss fabricators were in the best position to satisfy.

Regulatory Issues and Environment

All HUD-Code manufactured homes are constructed in accordance with the Federal Manufactured Home Construction and Safety Standards that have been in effect since June 15, 1976. This building code is administered by the U.S. Department of Housing and Urban Development (HUD). The HUD code regulates manufactured home construction and design, durability and strength, fire resistance and energy efficiency.

In the early 1990's, the HUD code was revised slightly to focus more on energy efficiency and ventilation standards and to improve wind resistance for prefabricated homes in hurricane-prone regions. Wind-code uplift strapping is apparent at the corners of many HUD-code homes.

The national Manufactured Housing program is designed to protect the health and safety of the occupants of manufactured homes. HUD issues, enforces and monitors Federal manufactured home construction and safety standards. The purpose of this program is to not only reduce personal injuries, deaths, property damages and insurance costs, but to also improve the quality and durability of manufactured homes.

These federal standards automatically overrule any state and local laws regarding manufactured homes that are not identical to the national standards. Under HUD regulations:

- Homes are required to be inspected at one stage of production by an inspection agency approved by HUD;
- The manufacturer has an approved quality control program in place throughout the production process;
- A HUD label must be applied to each home section by the manufacturer to indicate that it is in compliance with the HUD code;
- There exists certain procedures that manufacturer/retailer must follow should they become aware of a problem with a home after it has been shipped from the manufacturing facility.

Affordability

Construction costs for factory-built homes can range anywhere from 35 to 50 percent less than a comparable site-built home. Various studies performed on comparing costs of factory-built and site-built homes have confirmed that factory-built homes installed on permanent foundations, particularly in land-home deals, appreciate in value similar to other forms of housing.

Since the Fair Housing Act was introduced in 1968, great strides have been made towards providing equality of housing for all citizens in the U.S. However, obstacles to minority participation in housing practices still exist today. A recent study in the U.S. showed that minorities traditionally have been given less information, less assistance and less favourable terms and conditions when applying for a home mortgage than non-minorities. This is changing, however, and many of the housing 'giants' are now strongly targeting minority groups as prime markets for housing demand growth.

President Bush recently stated that he wishes to increase the number of minority homeowners by 5.5 million by the year 2010. To achieve this goal, HUD has been granted $50 million in the 2004 budget to put towards fair housing – a 9 percent increase over 2003 funding. As well, HUD, in collaboration with the Education Department and the Treasury Department, is trying to educate families about home ownership through counseling programs and financial literacy efforts.

HUD is also working to increase the amount of accessible housing for citizens with disabilities. This type of housing is likely to be concentrated in factory-built housing, as the overall costs are lower, and Federal departments can therefore reach more citizens.

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Conclusions – Market Opportunities, Strategic and Operating Issues

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Conclusions – Market Opportunities, Strategic and Operating Issues

The past several sections have provided an overview of the market opportunities for Ontario in the three groups of products that are the focus of this study. We have identified those which should be of key interest to Ontario's manufacturers, and evaluated the regional competitiveness of Ontario as a supplier to the Great Lakes states. *Volume 4 Opportunities Report* provides further details.[46]

In this section, we identify strategic issues and operating challenges facing the Ontario wood products industry. In several cases, they appear likely to inhibit the ability of Ontario manufacturers to capitalize on the market potential. Our conclusions are based on our analyses, evaluations and field and telephone interviews carried out in the US Great Lakes states and Ontario during the preparation of this report.

List of Strategic and Operating Issues

We have included only those issues that are relevant to this report and may directly influence the effectiveness of our recommendations. Excluded are certain market issues discussed in previous sections for the three product groups. Similarly, we have excluded certain operating issues, such as Crown Timber allocation, cost of fibre, log availability, purchased power costs and transportation costs because these lie outside the scope of our report.

Strategic Issues

These include issues about the direction in which Ontario's wood products industry currently is evolving, how the industry can implement change, and the question of the provincial government's facilitating role in the process of positive change. As landlord of the province's Crown timber commercial resources, the Government of Ontario has a key role to play in determining competitiveness and facilitating private sector initiatives.

Based on the report's assessment of market potential, how best can the province's manufacturers act on the types of opportunities identified in the US Great Lakes?

In several instances, we have identified areas where feedback from customers indicates that the competitiveness of some of Ontario's products could be substantially improved through better processing, lower and more consistent levels of moisture and better responses to customers' needs. Not all of these can be addressed adequately by private sector manufacturers. Yet, a mechanism to take them forward into action is lacking.

Going beyond the reactive to the proactive, we have concluded that Ontario has a short window of opportunity to achieve global competitiveness in some product groups through technological leadership, innovation and the creation of centres of excellence.

Many of the interviewees and workshop attendees raised important issues about investment and capital risks. These issues are of concern because, to achieve its full potential, Ontario will have to attract large tranches of new capital spending in the value-added wood products sector.

There was a very strong response to the issue of regional synergies. Many interviewees within Ontario and workshop attendees spoke of the 'disconnect' that exists between the resources of northern Ontario and concentrations of value-added manufacturing capacity in the south. Strategic issues are summarised under five headings in Table 12

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[46] Volume 4 is available only to firms with operations in Ontario.

Table 12
Key Strategic Issues

	Issue or Challenge	Main Areas of Impact	
		Primary Sector	**Value-Added Sector**
#1	Role of the Forest Products Industry within the Ontario Economy	It's role is unclear. Lack of widely accepted vision by public and government. High cost of doing business.	Disconnected from Ontario's timber resource based sector. Lack of competitive leverage. No industry level R&D.
#2	Achieving Global Competitiveness through Technological Leadership & Centres of Excellence	Market forces effective via consolidation, but very slow in bringing about upgrades in product-market mix. Ontario has a low value commodity product mix. Barriers to entry considered high by independent SME's. Timber fully allocated.	Varies with sector, but generally few globally competitive, independent firms emerging. Concerns about consolidation by US large firms. Some emerging global leadership via multi-national firms (e.g. EWP)
#3	Implementing Change	Depends on initiatives by individual firms. Market & new product opportunities well known but environment is highly competitive.	Several examples of individual effective efforts, but provincial level follow-up is lacking on strategic opportunities.
#4	Investment and Capital Risks In Ontario	Risk and uncertainty considered high by interviewees. Aversion to high CAPEX.	Potential markets identified, but few invest in CAPEX & productivity to offset loss of exchange rate advantage.
		Few linkages exist between integrated	Most SME's do not have resources or

#5	Lack of Regional Synergies (northern & southern Ontario)	primary manufacturers and independent value-added producers and remanufacturers – lost opportunities. Predominant export focus may have to shift under SLA II.	time to explore possible value-propositions involving Ontario primary firms. Scope for technological leadership exists, but largely inactive.

Operating Issues

Most operating issues are the domain of the private sector. However, we have identified three issues where external drivers are likely to have a significant impact of the future competitiveness of Ontario's wood products manufacturing sector. Operating issues are summarised under four headings in Table 13.

Table 13
Selected Operating Issues

Issue or Challenge	**Main Areas of Impact**	
	Primary Sector	**Value-Added Sector**
US-Canada softwood lumber trade negotiations in 2003 and possible 'SLA II' quotas	Negative impact on exports. Export focus will be on higher valued grades. Excess supply in domestic markets will depress prices Primaries will seek opportunities for value-added processing.	2-tier market prices will help improve domestic industry competitiveness in 1 of 3 selected product groups. No impact on other 2 groups. VA producers feel that Ontario lumber product quality will deteriorate, at a time when they want MSR, F-J and higher quality.
Canada's exchange rate in US Funds	Recent appreciation already having a negative impact. Further appreciation may eliminate several producers and precipitate more mill closures.	Recent appreciation already having a negative impact. Few VA producers are investing in productivity to offset loss of exchange rate advantage.
High level of imported raw materials and finished products	Several closures (e.g particleboard) due to cheaper imports and competition from Quebec. Ontario producers not always effective in competing with imports.	Ontario millwork industry is vulnerable to very cost-competitive finished products arriving in greater volume. Ontario suppliers frequently indifferent and uncompetitive.

Skilled labour supply	Cited as a major concern by many primary mills.	Automation not widely perceived as economically viable, or a potential solution.

The most urgent operating issue reported during the interviews is the need to achieve a viable and sustainable resolution to Canada's softwood lumber dispute with the United States. As a specific outcome of current discussions, there appears to be a strong probability that import quotas will be part of the agreement in place if a new softwood lumber agreement ("SLA II") is finalized.

The administration of these quotas will be critical to many players within the Ontario wood products industry, and particularly on value-added producers such as lumber remanufacturers. There is anecdotal evidence that the 1996-2001 Canada-US Softwood Lumber Agreement ("SLA I") provided a boost to certain segments of Ontario's value-added manufacturing sector. But there were also many areas where the normal evolution of market forces was badly disturbed. These need to be addressed.

Over the past several months during 2003, the Canadian dollar has risen sharply in value in US dollar terms, from around 63 cents early in the year to around 77 cents currently (with a short term peak of nearly 78 cents in November 2003). Over half the Ontario value-added and primary wood product manufacturers interviewed reported that the exchange rate advantage is the most important competitive advantage they have in exporting to the United States. Further appreciation of the Canadian dollar will bring severe hardship to many resource-based communities.

A large number of interviewees also reported that the shortage of people with adequate skills training and industry experience for the job being offered is a major constraint on their expansion plans. Several also noted it as a threat to continuity of their current business volume. The need for labour flexibility on the job was also noted.

In discussions about automation (capital replacing labour), several leading edge firms, notably in structural EWPs, are making significant CAPEX investments to lower unit costs of manufacturing. However, a large percentage of other manufacturers reported their reluctance to invest heavily in automation due to (a) it is not perceived by the firm to be economically viable, and (b) technologically, it doesn't always provide workable solution in batch production technologies.

Discussion of Strategic Issues

Lack of sector vision and supportive public policies are among the most fundamental strategic weaknesses underlying the ability of Ontario's wood products industry to become globally competitive in future generations of manufacturing technology. The future role of the industry within the provincial economy is unclear to many stakeholders. Its global role in the very competitive world of wood products is unclear to capital markets and other providers of funds for growth and expansion.

Despite its many substantial contributions to the provincial and national economies, there is a lack of widely accepted vision for the sector among the public and within government. In fact, northern Ontarians, in particular, report that there appears to a poor perception by the provincial government about the sector's growth potential. We believe that this situation could impede Ontario in its pursuit of market opportunities in the US Great Lakes, as identified in this report.

Strategic Issue #1 Role of the Forest Products Industry within the Ontario Economy

Ontarians' Perception of their Value-Added Wood Products Industry

Manufacturing of value-added wood products receives little attention from most residents of southern Ontario and is over-shadowed by fast growth, high-profile technology-linked manufacturing and service sectors of the provincial economy.

In northern Ontario, the growth of value-added wood products manufacturing is perceived as a very positive development within the forest industry. As traditional forest industry activities decline, and sawmill and other closures are announced, value-added is widely supported by local residents as potential "good news" for resource-dependent communities. There are over 40 forest-dependent communities in the province[47].

In several rural communities, Ontario can boast its success in attracting significant new capital investment in state-of-the art value-added structural engineered wood product plants, some of which are currently the best in the world. Many civic leaders are proud champions of sustainable forest-based manufacturing activities and are active in promoting these within their communities.

They are active in pursuing job creation opportunities, and in providing stable employment opportunities to help anchor young people who might otherwise have to go elsewhere to seek work. Through economic development efforts, rural and urban communities alike seek the development of clusters of related processing activities.

At the public policy level, the production of value-added wood products normally is associated with resource industry activities. In fact, in some parts of the value-added sector such as manufactured housing, wood products may make up only 10% of the final sales value.

Truss and wall panel producers buy wood products (not all from Ontario), but usually do not regard themselves as being part of the forest industry. Window manufacturers use more vinyl and aluminum than wood in many instances, and in many respects, are part of the building materials and housing industry. Today, door and moulding manufacturers look to out-of-province suppliers for most of their raw materials.

The sector employs large numbers of designers, engineers, software specialists and housing market specialists. Clearly, there are strong linkages to Ontario's knowledge–based industries.

The province has extensive forest resources compared with other provinces, and has significant levels of commercial forest in a global context. For many residents, Ontario's forests are valued for their recreational and conservation virtues. There is a strong desire to ensure high standards of environmental protection. Commercial utilization of the working forest is not considered to be a high priority among many Ontarians.

Yet, the wood product sector's direct connections to high-tech and knowledge-based economic activities make Ontario's value-added wood products industry one of the most attractive 'new-age' and sustainable contributors to the provincial economy. It's not just about trees.

A 'disconnect' has emerged between the province's Crown forests and the manufacturing industries they support directly, or help to support indirectly. As a result, Ontario is not achieving the competitive leverage that is available.

This can be rectified, but without a vision of what can be achieved, and actions to pursue this vision, the province's value-added wood products manufacturing sector will remain fragmented and relegated to the role of a second or third string player within Canada.

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[47] www.ofia.com '*The Ontario Forest Products Industry (1998)*

Perceived Decline of the Forest Sector in Ontario

The perceived decline of Ontario's forest sector among many members of the public and within the provincial government may be incorrect based on the facts, but perhaps not difficult to understand. During the summer of 2003, for example, there were numerous announcements of sawmill permanent closures or mills being shut down for market reasons. In addition, several other plant and mill closures in panelboards and allied industries were announced.

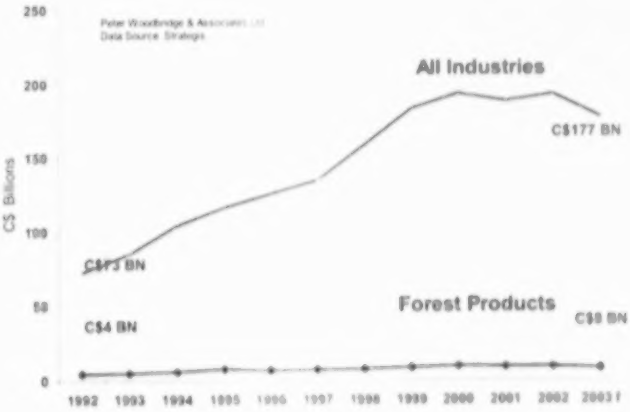
Consolidation within the lumber industry is also a high profile indicator of a sector undergoing major changes. In June 2003, for instance, Domtar and Tembec (which both have mills and harvesting operations in Ontario) announced a joint-venture merger of their wood products manufacturing facilities and marketing resources, but this has now been cancelled. (See footnote 12)

These changes come after several decades of sometimes acrimonious debate about the appropriate balance between environmental protection and commercial harvesting of Ontario's softwood and hardwood timber resources. Recently, a multi-stakeholder, province-wide initiative led to widely supported agreement on a vision for the province's forests under the Ontario Forest Accord initiative and the 'Room to Grow' programs arising from this principle.

Three principles under 'Room to Grow' are creating room for growth in new parkland, room for growth in wood supply for industry and room for growth in jobs for Ontarians[48]. In our view, this (a) demonstrates that under the right leadership, a multi-stakeholder consultative and solutions-focused approach works well in Ontario and (b) can help bridge the north-south impasse on priorities for economic development.

Chart 77

Ontario Exports to the United States


Peter Woodbridge & Associates Ltd
Data Source: Strategis

It is true that, as a group, 'other industries' within the province have outstripped Ontario's forest products manufacturing sector in export market performance overall (Chart 77), but the performance of Ontario's forest industry frequently is under-rated.

Chart 78 shows the performance of Ontario's 'all industries' exports to the US compared with that of its forest products industry to the same market over the period 1992-2003 (year-to-date). The export value of 'all industries' shipments to the US rose by 145% over the period to C$177 Billion estimated for 2003.

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[48] Ontario Forest Accord Advisory Board (OFAAB) *Interim Report to the Minister* March 6th 2001 www.mnr.on.ca

Over the same period, the export value of forest industry shipments to the US rose by 100% from around C$4 Billion to nearly C$8 Billion. These overall data disguise the rapid rates of export market growth being in (a) primary sectors, such as softwood lumber and OSB during the 1990's and (b) the more recent growth in value-added items such as roof trusses, wall panels and structural engineered wood products (EWP).

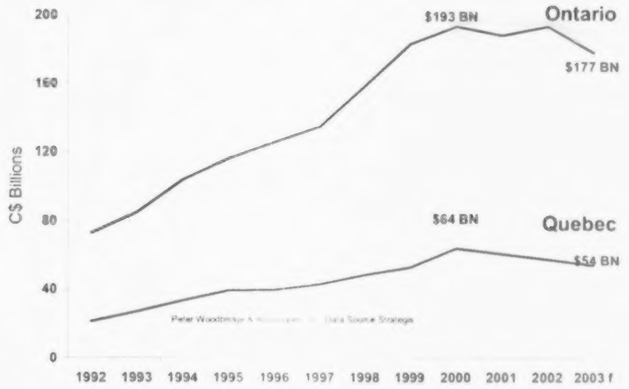
In addition, independent and non-integrated value-added wood product manufacturers within the province, such as wood window, door, furniture and kitchen cabinet producers are prospering in response to rapidly increasing domestic demand and the needs of the currently hot Toronto housing market.

It is also important to note that the export market performance of Ontario's forest products manufacturing sector compares very well with that of other Canadian provinces, and far outstrips that of the US Great Lakes region. Although Quebec has moved faster and further in fostering its forest industries, the fact is that Ontario is a significant regional player.

The Ontario economy is one of the top performing economies within Canada. Chart 78 shows that Ontario's 'All Industries' exports to the United States during the 1990's rapidly outgrew those of Quebec. After peaking in 2000, Ontario's exports to the US declined by 8% to 2003 compared with a 10% decline for Quebec. In Ontario's case, the decline is very sharp so far during 2003.

Chart 78

**Ontario's 'All Industries' Exports to the U.S.
Have Grown Faster than Quebec's**



By focusing only on 'All Industry' and particularly high profile, hi-tech and non-manufacturing exports, it is easy to under-estimate the contribution of Ontario's forest sector and allied industries.

National Perspective: Ontario's Forest Sector is Over-Shadowed by Quebec and BC

Over this period, the 'disconnect' between the independent and non-integrated value-added wood product manufacturers in Ontario and the province's primary wood products industry grew even larger. Few synergies were achieved. Industrial cluster formation was marginal and, within parts of Ontario, the mindset was that Ontario became, in the context of the Canadian forest products industry, a "poor cousin" to BC and Quebec

Today, there is no widely accepted vision of the Ontario forest sector's future that would help reverse this thinking.

Rural and northern Ontario communities, faced with closure of some increasingly obsolete primary wood products capacity, are encouraged by major new investments such as Trus Joist/Weyerhaeuser's state-of-the-art TimberStrand plant at Kenora, Ontario, and some other value-added investments in communities such as Timmins. But they see no evidence of a widely supported vision of product upgrading by significant parts of the commodity wood products and dimension lumber industry.

What Business Are We In?

In previous reports[49], we have concluded that one of the most powerful forces which drive regional competitiveness is management's strategic focus. In particular, analysis shows that where the senior management of a firm has a clear understanding of its core competencies, and is able to act on them, this can provide a substantial and sustainable competitive edge to the firm.

In much the same way, senior management in the public sector strives to capitalize on the core competencies that are evident in leading growth and emerging sectors of the provincial and national economies.

Michael Porter and Richard Martin have concluded in studies of competitiveness in Canada that "resource-based industries have been and will remain a mainstay of Canada's economy"[50].

With regard to the forest products sector, our analyses[51] indicate that the value-proposition that served provinces well in the past is now largely obsolete. We conclude that a new value-proposition, focused on providing value-added manufactured products and knowledge-based services to the United States, is the key to regaining a significant competitive edge in wood product exports.

At this critical juncture of development in Ontario's forest products manufacturing economy, it is relevant to ask the strategic question "what business are we in?"

One view is that the Ontario forest products industry is a supplier to six main types of global-scale businesses. These are summarized below and shown in Table 14.

- Communications papers;
- Structural wood products;
- Consumer products – appearance products;
- Packaging papers & shipping materials;
- Consumer products; and
- Raw materials subsequently processed elsewhere.

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[49] The Woodbridge Competitiveness Model. *Manufacturing of Value-Added Wood Products in Western North America: How Competitive is BC? (March 2003)*. Produced for the IVAWA by Peter Woodbridge & Associates Ltd. Available as a free download at www.woodbridgeassociates.com

[50] Michael Porter and Roger Martin – *Canada at the Crossroads*.

[51] *Manufacturing of Value-Added Wood Products in Western North America: How Competitive is BC?* ibid.

Table 14
Types of Global Businesses Supplied by Ontario's Forest Products Sector

Type of Business	Related Products from Ontario Forest Products Industry
Communication Papers	Newsprint and publication papers Printing papers Fine papers Stationery
Structural Wood Products	Dimension softwood lumber Structural panelboards –OSB Engineered wood products (I-Joists, laminated products) Building components (trusses, wall panels, pre-cut, modular)
Consumer Products-Appearance Products	Kitchen cabinets and countertops Flooring, including sub-flooring (e.g. Dricore) Mouldings and millwork Architectural millwork Windows and doors Wood furniture Hardwood plywood
Packaging Papers & Shipping Materials	Paperboards Corrugated boxboards Folding carton & set-up boxboards Pallets and wood containers
Consumer Products	Tissues Furniture Miscellaneous non-structural wood products
Raw Materials Subsequently Processed Elsewhere*	Market pulp Dimension and other softwood lumber Non-structural panelboards – MDF and particleboard Veneers Cut stock & re-sawn lumber for remanufacturing Hardwood plywood (mostly shipped out of province)

Source: Peter Woodbridge & Associates Ltd.
* Some of these are further processed within Ontario usually at non-integrated facilities

Communications Papers Business

Over the past decade or more, there has been a sharp shift in Ontario's role within the communication papers business. Early in the 20th Century, Ontario became a dominant global supplier of newsprint to US and overseas publishers, and a technology leader. This role has diminished, technology has changed (greater use of re-cycled fibres) and the low-cost producers are now mainly located elsewhere.

Companies in this business, such as Domtar, have refocused on higher value communication papers. Others, such as Abitibi, have become top global players in publications grades and have invested outside of Canada, in the US and elsewhere.

Structural Wood Products Business

In the structural wood products business, Ontario historically has had a secondary role in softwood lumber production and exports. It became a volume producer during the 1990's, but much of its output is in narrow dimension eastern SPF. Our fieldwork in the US Great Lakes shows that eastern SPF often is perceived to be of lower quality than western SPF is perceived, and typically is priced below western SPF.

Hardwood plywood production within the province has declined, but Ontario has become an important producer of OSB based on its low density hardwood resources (aspen) and, more recently, a global scale producer of engineered wood products such as LSL lumber (TimberStrand, using aspen). The province produces sizeable volumes of MDF and is a significant supplier of I-Joists, wall panels, roof and floor trusses, pre-cut residential homes and modular structures.

Demand for structural EWPs is growing at a faster rate than the demand for lumber, but not as quickly as consumption of building components. EWPs are suited to the Ontario wood products manufacturing culture because the production processes are automated and fast speed. Production of building components currently is a custom order, batch process in most cases and plants are operated mainly by independent firms.

Lumber and building materials (LBM) supply chain changes, and consolidation of the US homebuilding industry, are bringing about a major evolution in the structural wood products business.

Throughout this report, we argue that Ontario has the potential to become a significant player in the structural wood products business, but only if it develops the 2nd and 3rd generation technologies that can help define its future growth.

Consumer Products-Appearance Products

In this report, we have looked at export market opportunities for Ontario manufacturers of wood windows and doors and other millwork, including mouldings. These are among several groups of appearance grade or consumer products produced within Ontario and elsewhere. Residential new construction, remodeling expenditures and industrial-commercial spending are key drivers of demand for these products.

The situation varies by product group, but generally, demand for the products is growing at a comparatively fast rate. From a manufacturing and economic perspective, these are attractive value-added businesses, with rapid rates of domestic and export demand growth in many instances.

Ontario is the base for large producers such as Masonite, Royal Group and Alexandria Mouldings, but these products do not always tie-in well to Ontario's existing primary wood products industry because of the extensive use of non-wood materials and procurement from out-of-province.

Packaging Papers & Shipping Materials

This is an important business for segments of the Ontario forest products sector, but is not pertinent to this report.

Consumer Products

These also are a key part of the evolution of value-added manufacturing of forest products in Ontario, but discussion lies outside the scope of this report.

Raw Materials Subsequently Processed Elsewhere

This business group includes a variety of intermediate products, such as market pulp, that are sold to papermakers elsewhere. Also included in this group are wood products, such as lumber and OSB, that are shipped from Ontario to markets in the US Great Lakes and elsewhere. Some of these products potentially offer opportunities for further processing into value-added wood products in Ontario, and are of considerable interest to this report.

The Challenge

We conclude that if Ontario is going to realize the full potential of its wood products and value-added manufacturing sector, a credible vision of its future potential should be developed. To be meaningful, this vision should be able to garner widespread support among senior decision makers and lead to actions on a defined time schedule. We believe that this process has to be led by Ontario's private sector forest industry firms (i.e. the CEOs).

Importantly, the status of Ontario's wood products and value-added manufacturing sector among senior public sector decision makers also needs to be improved so that initiatives to pursue new jobs creation, increased export earnings and sustainable northern development can be given a high priority.

Strategic Issue #2: Global Competitiveness through Technological Leadership & Centres of Excellence

What Business Should We Be In?

Ontario's value-added wood products manufacturing industry is a significant part of the regional supply chain. In the U.S., different states excel in different products, and some jurisdictions are more heavily involved in primary wood product processing than others. By virtue of the scale of its fibre base, Ontario is a substantial player in the region.

The challenge for Ontario is to maintain and enhance its regional and international competitive position. In our view, very strong growth rates are required in products in which Ontario's wood products sector can excel over the longer term. We suggest that the best product sector in which Ontario should seek to attract high levels of sustained investment is structural engineered wood and building components.

Within the Great Lakes, certain states already are global and technology leaders in certain types of value-added wood products manufacturing (Table 15).

In factory-built housing, examples include Pennsylvania and Wisconsin (residential modular) and Indiana (HUD Code). In the windows and doors business, Wisconsin and Minnesota excel in overall capacity and new technology.

Michigan, Ohio and Illinois have significant manufacturing capacity in batch production of roof trusses and wall panels, while Minnesota has had a significant position in the U.S. structural panelboards (OSB) business.

In floor construction, there are no readily identifiable market or technology leaders in the US Great Lakes states. I-Joists, which hold 26% of the US market for single family structural flooring materials (see Section A), are imported from other areas, including Ontario and Quebec. Much of the Great Lakes market is still dominated by dimension lumber supplied from the west and south, but this traditional product is losing market share.

Table 15

'*Centres of Excellence*' in Selected Value-Added Wood Products
US Great Lakes States

State	Value-Added Product	Emerging Technology
Pennsylvania Wisconsin Indiana (HUD Code)	Factory-Built Housing	Automated Modular-Construction
Wisconsin Minnesota	Windows & Doors	Wood-Plastic Fibreglass Composites
Michigan Ohio Illinois	Batch Production Wood Trusses & Wall Panels	See below
Minnesota Michigan	Structural Panelboards	Non-Wood Materials
None !	Structural Engineered Wood	2nd & 3rd Generation EWPs. Integrated Structural Systems Design
None !	Floor, Wall & Roof Components	2nd Generation Systems Open Web Systems SIPs

Peter Woodbridge & Associates Ltd.

Open web joists are a comparatively recent innovation at the commercial level, and leadership in this technology currently appears to be concentrated in Quebec. Wall systems are in an early stage of evolution and none of the Great Lakes states or Ontario (or Quebec or BC) so far have any readily identifiable competitive edge derived from superior technology.

Correspondingly, these are examples of product areas that remain "open" for new technological advances and states or provinces to emerge as future 'centres of excellence'.

The Challenge

We conclude that value-added wood products in which Ontario can attain a globally competitive position should be included as a key market-driven goal that drives a sustainable vision of the Ontario wood products manufacturing sector. Resource, public policies, related initiatives and programs such as enhanced R&D expenditures should be pursued aggressively to support the achievement of this vision.

Strategic Issue #3: Implementing Change

Growth Opportunities – Who Will Act?

The market opportunities identified in this report can be acted upon by any competent manufacturing firm. However, the reality is that some are in a much better position to do so than others.

In some cases, Ontario's integrated value-added wood products manufacturing industry is far better positioned to bring together the capital resources and international distribution network, and build the economic scale of plants that will minimize unit costs. In other cases, the SME independent non-integrated sector is better adapted to being able to respond to the needs of the market.

There is some overlap in the value-added wood product manufacturing activities carried out by integrated, non-integrated firms and distribution/construction firms. A brief summary is provided in Table 16.

The table indicates that integrated firms play a major role, through the breakdown of logs, in the commencing stages of the flow of raw materials needed by value-added wood product manufacturers. Integrated firms participate in value-added manufacturing activities, sometimes on the same site (e.g. TimberStrand at Kenora) and sometimes at non-integrated plants where they may purchase some wood raw materials from outside.

For the most part, where Ontario integrated producers are involved in secondary processing activities, they focus on structural products such as I-Joists. Some value-added set-up activities are carried out on-line (sorting, grading), while others are carried out off-line at the same location (e.g. MSR lumber) or at off-site facilities (e.g. I-Joists).

There is some production of hardwood flooring, MDF components and specialty engineered non-structural flooring made from OSB, but the main volume activity for integrated firms is linked to structural wood products. Integrated firms generally are not involved in custom and 'batch' production building components such as truss production or in panelized wall production.

Non-integrated secondary manufacturers account for the bulk of truss and wall panel production and much of the laminated structural beam and post production in Ontario. They are actively involved in further processing of primary wood products purchased either from Ontario producers or from out-of-province suppliers. In non-structural manufacturing activities and products, non-integrated producers dominate. In most cases, these are in response to custom orders and involve mainly batch production manufacturing technology.

Table 16
Ontario: Summary of Key Types of Manufacturing Activities, By Sub-Sector

Manufacturing Activity / Product	Integrated Forest Product Firms	Non-Integrated Value-Added Manufacturers Including Remanners	Others in the Supply-Chain
Primary breakdown of logs into wood products for structural uses	✓	Limited activities	
Secondary processing of structural engineered wood products (EWP)	✓	✓	✓
Secondary processing of structural components	✓	✓	Limited, but some Toronto homebuilders investing in captive facilities e.g. Mattamy Homes
Primary breakdown of logs into wood products for non-structural uses	✓	✓	
Secondary processing of non-structural EWP	Limited activities	✓	✓
Secondary processing of non-structural components	Limited activities	✓	✓

Peter Woodbridge & Associates Ltd.

Others in the supply-chain also may be involved in secondary processing of EWPs, notably distributors. For example, a Toronto homebuilder recently has invested in his own structural component facilities.

Window, door and millwork producers are extensively involved in secondary processing of non-structural wood as part of their manufacturing process. They consume some Ontario-produced wood products such as MDF, but for the most part, rely on imported raw materials.

Innovation and Competitiveness

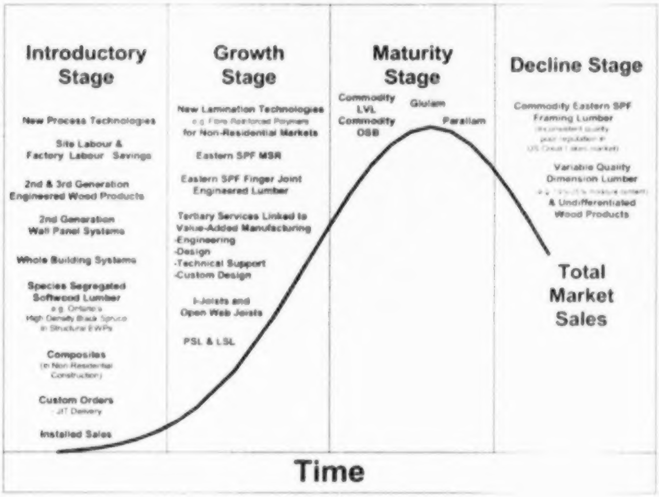
Engineered Components and Structural EWPs – Life Cycle

As in many businesses, the wood products industry is able to produce new and higher performing products on an ongoing basis. This is a healthy evolution.

Parallam, for example, still dominates the North American longer structural beams residential market and enjoys a healthy market share. It is being challenged in shorter spans by other products. Homebuilders' desire for a cheaper, lighter weight EWP, combined with new product research in PSL and LSL technologies, has helped TimberStrand (LSL) expand its capacity (eg. new state-of-the-art plant at Kenora, Ontario) and its market share. This has been facilitated by the availability of lower cost 'feedstock' (e.g. aspen in Ontario).

Chart 79

Product Life Cycle: Engineered Wood


Introductory Stage
New Process Technologies
Site Labour & Factory Labour Savings
2nd & 3rd Generation Engineered Wood Products
2nd Generation Wall Panel Systems
Whole Building Systems
Species Segregated Softwood Lumber
e.g. Ontario's High Density Black Spruce in Structural EWPs
Composites
(in Non Residential Construction)
Custom Orders
- JIT Delivery
Installed Sales
Growth Stage
New Lamination Technologies
e.g. Fibre Reinforced Polymers
for Non-Residential Markets
Eastern SPF MSR
Eastern SPF Finger Joint Engineered Lumber
Tertiary Services Linked to Value-Added Manufacturing
-Engineering
-Design
-Technical Support
-Custom Design
I-Joists and Open Web Joists
PSL & LSL
Maturity Stage
Commodity LVL
Commodity OSB
Glulam
Parallam
Decline Stage
Commodity Eastern SPF Framing Lumber
(inconsistent quality poor reputation in US Great Lakes market)
Variable Quality Dimension Lumber
& Undifferentiated Wood Products
Total Market Sales
Time

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Decline Stage

Chart 79 shows a simplified life-cycle portrayal for engineered wood. Several products within Ontario's overall wood product mix are in the 'decline' stage of their cycle, and these are shown for perspective.

For the Ontario wood products industry, these include commodity grade eastern SPF framing lumber and plywood. In some interviews, builders and distributors have complained about the variable quality of E-SPF dimension lumber. Increased displacement of these products by supply from other regions (Southern Pine) and other products, such as EWP (predictable, measurable and consistent) is anticipated. However, the life-cycle of some of these products can be extended (see below).

Maturity Stage

Commodity LVL and commodity OSB are reaching a mature stage of demand growth. Other products in this category include glulam and Parallam. This does not imply that demand for these products is declining, simply that rates of demand growth are much slower than they were earlier.

In North America, glulam in most residential applications is at an advanced stage between maturity and decline, but with new technology such as fibre-reinforced polymers, glulam may have an expanding future in non-residential applications. Overseas demand is still strong.

Growth Stage

Several products produced by Ontario's primary wood products industry, or by independent SME plants, are at a growth stage. These include E-SPF stress graded lumber (MSR) and E-SPF engineered fingerjoint lumber. Some edge-glued long lengths also are produced in wides.

I-Joists and open-web joists also are at a growth stage in the building components cycle. Parallel strand lumber and laminated strand lumber are strong growth products, as we showed in Group A.

One of the competitive features of Ontario's building components industry (e.g. trusses and wall panels) is that producers are able to respond well to customers' needs for custom design. Frequently, Ontario's independent value-added plants will provide full design and engineering services based on shop drawings. This is a strong feature of the value-added that is provided to the distributor or builder-framer. There is strong growth potential in knowledge-based manufactured products.

Introductory Stage

A wide array of new process technologies and products are at the introductory stage and may provide opportunities for Ontario manufacturers. Key drivers for this process are the need to overcome site-labour shortages and achieve savings through off-site fabrication. Second and third generation EWPs, 2nd generation wall panel systems and whole building systems were discussed in Section A.

An immediate opportunity for the Ontario industry, but still in the introductory stage, is a more extensive level of species segregation. The unique attributes of the province's black spruce, for example, have been identified by several sources. These could be the source of a competitive advantage for Ontario's wood products industry. Chart 80 showed that merchandising logs in the woods is the start of this value process. In addition, marketing and promotional efforts would be required to launch this species effectively at an industry level.

Composites, which already are becoming established in non-residential construction, have wide range of possible applications in homebuilding. Structural insulated panels (SIPs) are emerging from the introductory to the growth stage in some market areas.

A further aspect of service and technical support for primary and value-added wood products is the producer's ability to meet JIT needs and respond to custom orders. Installed sales are increasingly a feature of many markets.

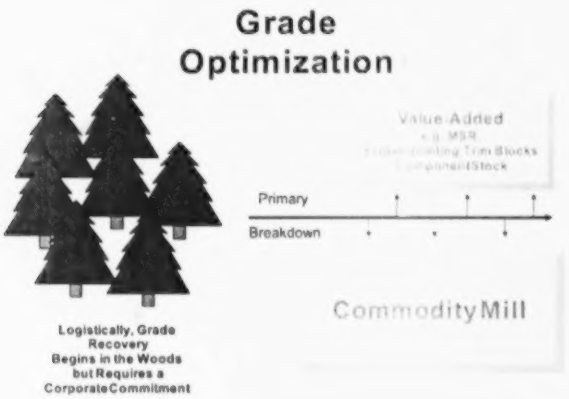
Extending the Life-Cycle of Ontario's Primary Wood Products

Producers can extend the life-cycle of their products through various adaptive means. In many cases, the demand for a product declines because it is not meeting the needs of the user. Maybe it never did, completely. The availability of alternatives is an opportunity for the framer to try alternative materials.

In many instances, eastern SPF loses out to western SPF in the Great Lakes market. Our interviews show there is a strong perception in the US Great Lakes market that E-SPF is of inconsistent quality, with high variations in moisture content and finished quality. It appears that several Ontario mills set their target sizes too small in order to increase volume throughput. Emphasis is on quantity rather than achieving a market-quality product.

Together with the use of incorrectly adjusted chipper-headers that 'rip' the lumber and result in scored knots, plus the high volume commodity production culture of many mills, this results in a product that is not well dressed and has low visual appeal. Poor initial breakdown quality also restricts the volume that can be further processed for increased value-added at the sawmill through, for example, the MSR process.

Chart 80



Ontario has a viable future in the commodity lumber framing business. But the volume of saw-logs going through to this end-use, in isolation of cutting and processing for value, is likely to decline sharply. By setting higher value target-grades, and diverting a higher percentage of primary production into value-recovery (Chart 80), a lot could be done by the primary wood products industry to assist the growth and development of value-added manufacturing in Ontario.

These opportunities would be available in some cases to the primary mill and at other times to value-added independent manufacturers. Geographically, many of these opportunities could be developed in northern Ontario close to existing clusters of primary mills. European technology is available for some of these functions to be carried out on-line at high speed mills in North America.

The Challenge
We conclude that the wood products and value-added manufacturing sector within Ontario should be the central stakeholder and driver of change to achieve these market opportunities.

Strategic Issue #4: Investment and Capital Risks in Ontario

As we noted earlier, a 1998 Price Waterhouse study showed that despite significant levels of annual capital expenditures, the industry's underlying costs and debt levels were high, company earnings were low and return on capital was low on average.

The issue of risk-reward is critical to the province's ability to attract the large amounts of long term capital funds that will be necessary for the private sector to act on the opportunities identified in Groups A, B and C.

The Challenge
We conclude that independent analyses are required to ascertain the competitiveness of the business environment in which the Ontario value-added sector operates. Subsequently, recommendations should be made to place Ontario in a 1st place position to attract investment funds into the sector.

Strategic Issue # 5: Lack of Regional Synergies (Northern & Southern Ontario)

We have indicated in several parts of this report that there is a lack of regional synergy between timber resource-based manufacturing sectors in northern Ontario and value-added wood product manufacturing clusters mostly in southern Ontario. For the most part, much of Ontario's value-added wood products manufacturing growth has not been linked to its primary wood products industry.

In terms of exports, Table 17 provides some examples of where a significant percentage of the province's wood products manufacturing exports to the United States in 2002 were in products made by industries which imported a significant volume of their raw material requirements from other areas of Canada (e.g. western SPF) and Quebec, or elsewhere. Moreover, these were large and important value-added sub-sectors.

When wood furniture and kitchen cabinets are taken into account, imports of raw materials such as MDF from Chile and components from China are seen to be significant and growing.

Table 17

Ontario's Value-Added Product Groups Relying on Significant Imports of Raw Materials

Product-Group	Raw Material	Local Supply Dominates	Raw Material Imports are Significant
Wood Furniture	Hardwood lumber		✓
Kitchen Cabinets	Non-structural boards (particleboard, MDF) Exotic laminates		✓
LSL Lumber (TimberStrand)	Whole logs (aspen)	✓	
Wood Trusses **Wall Panels**	Dimension lumber OSB	✓	Some imports of W-SPF lumber
Moldings & Millwork	Softwood lumber MDF	Some use of local supplies, but sizing and finishing not readily available	✓

In the Phase I report in this series, authors Jaakko Poyry correctly argued that successful development of value-added clusters need not necessarily have direct linkages to locally available wood supplies and other resources. Global benchmarking in Phase 1 showed that several well developed and internationally competitive wood product-based sub-sectors overseas, such as wood furniture in Italy, do not have a strong linkage to local wood supply.

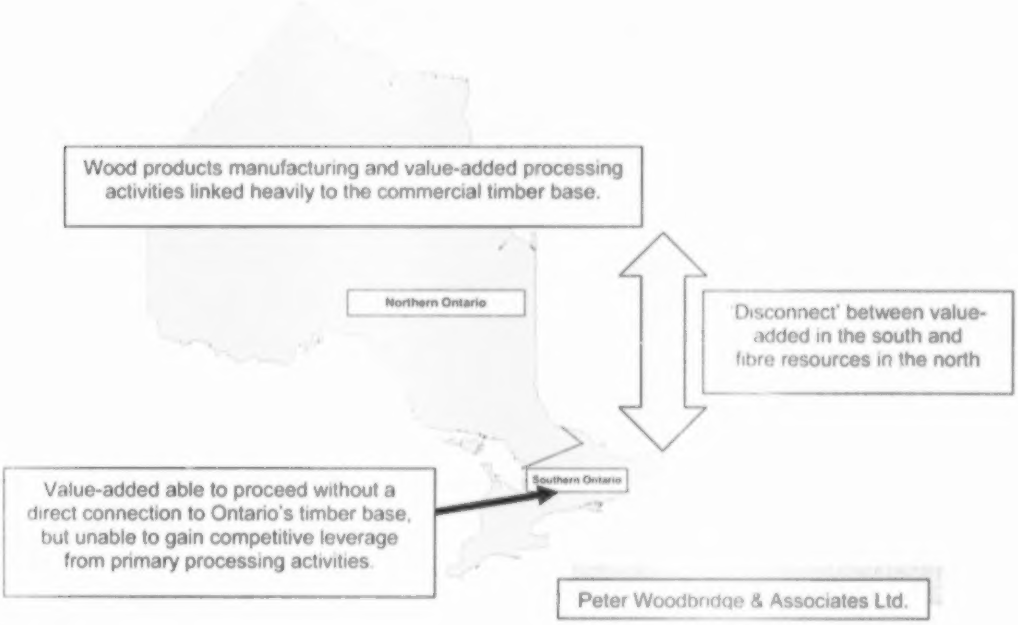
For much of northern Ontario, however, where the dominant wood products manufacturing activity is heavily towards lumber and structural boards, an infrastructure does not exist of skilled value-added labour able to produce value-added wood products based on imported raw materials. Also, logistical considerations and long transportation haul distances provide a strong disincentive to northern wood products manufacturing activities that cannot gain some competitive leverage from the local wood resource.

The shaded areas in Table 17, however, provide examples of dimension lumber and structural EWPs that do derive a significant competitive edge from fibre-manufacturing linkages. In our view, this suggests a split in the woods industry development potential that is appropriate to the north of Ontario, on the one hand, and the considerably more developed value-added industry in the south of the province.

Value-added manufacturing of various kinds does take place throughout the province. Even so, without investment and supporting initiatives to facilitate better linkages and clustering development, the preponderance of various potential wood product manufacturing activities is likely to continue to show a regional bias. This concept is illustrated in Chart 81.

Chart 81

Ontario
A 'Disconnect' Exists between Value-Added in the South and Northern Resources



Wood products manufacturing and value-added processing activities linked heavily to the commercial timber base.

'Disconnect' between value-added in the south and fibre resources in the north

Value-added able to proceed without a direct connection to Ontario's timber base, but unable to gain competitive leverage from primary processing activities.

Peter Woodbridge & Associates Ltd.

Ontario's Independent Value-Added Producers Don't See Themselves as Part of the Forest Industry

Another factor contributing to the lack of synergies between Ontario's resource-based primary manufacturing sector located mainly in northern Ontario, and the large clusters of independent non-integrated value-added wood products producers in the south is that many value-added producers don't see themselves as part of the forest industry.

Instead, they see themselves as being in businesses that are very different from the wood products industry which they regard as being simply one of many suppliers. Although value-added wood products are a key part of the success of these other businesses, there are still many wood products suppliers in Ontario who are not willing to "go the extra yard" and provide non-commodity services to specialty and custom users, even if these involve potentially high volumes of product.

Non-Integrated & Independent Value-Added Manufacturers Have Prospered
Many of Ontario's wood flooring, kitchen cabinet and countertop manufacturers have won award-winning designs for their products in domestic and export markets. Ontario's mouldings and other millwork producers, including Masonite and others, have prospered despite facing significant overseas and US competition. Moreover, the domestic market is flourishing at present.

The Challenge
We conclude that further consideration should be given to ways in which economically viable and better linkages and synergies can be achieved between (a) the primary and independent non-integrated sub-sectors of the Ontario wood products manufacturing industry and (b) resource-linked northern communities with surplus labour and labour-short southern communities (e.g. outsourcing).

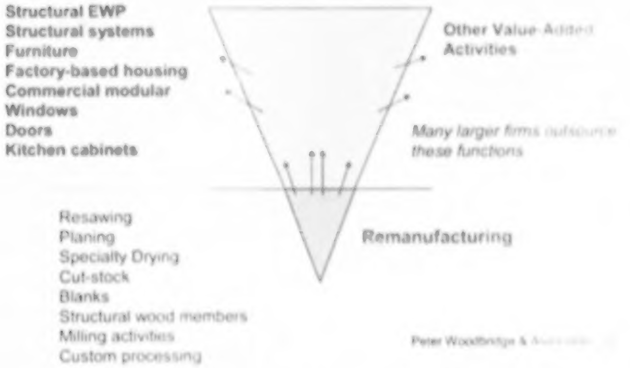
Operating Issues

Operating Issue #1:
US-Canada Softwood Lumber Trade Negotiations in 2003 and possible 'SLA II'

The protracted length of countervailing duty and recent anti-dumping charges by the United States against Canadian producers from most origins occupies a great deal of senior management and senior government time, and is very costly.

Chart 82

Remanufacturing Activities are an Essential Base for Many Subsequent Value-Added Processing Steps


Structural EWP
Structural systems
Furniture
Factory-based housing
Commercial modular
Windows
Doors
Kitchen cabinets
Other Value-Added Activities
Many larger firms outsource these functions
Resawing
Planing
Specialty Drying
Cut-stock
Blanks
Structural wood members
Milling activities
Custom processing
Remanufacturing

Peter Woodbridge & Associates

Detailed discussion is beyond the scope of this report. However, it is clear that the softwood lumber trade situation could significantly impede Ontario's growth in certain parts of the non-exempt and allied exempt from duty industry. In particular, remanufacturing which is the fulcrum for much subsequent value-added processing (Chart 82) is particularly vulnerable to further trade action and/or an unsatisfactory settlement.

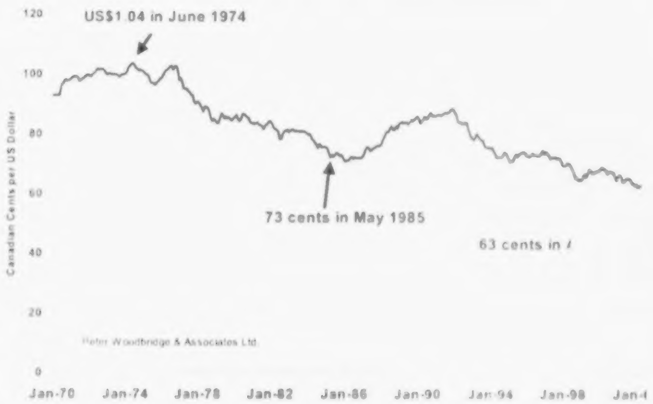
The Challenge
We conclude that the province's administration of any volume quotas under "SLA II" should be equitable to resource-linked sub-sectors of the value-added wood products processing sector.

Operating Issue #2: Canada's Exchange Rate in US Funds

Nearly two thirds of interviewees within our Ontario surveys said that the exchange rate premium is the primary source of their competitive advantage.

Chart 83

The Canadian Dollar's Long Decline



Large scale and high productivity levels achieved in Canadian primary wood product mills are also fundamental reasons why many of Canada's wood products and building components suppliers are globally competitive. With substantial global overcapacity in softwood lumber, however, even the most cost competitive mills are struggling with low profitability and market prices below cash costs.

To a large extent, Canadian wood product manufacturers' competitiveness depends today on the progressively greater exchange rate advantage, in terms of US funds, they have enjoyed since the mid-1970's.

The Challenge
With the partial reversal of Canada's exchange rate advantage in US markets, Ontario firms will have to rely much more for their competitiveness on manufacturing efficiencies and productivity.

Operating Issue #3: Lack of Skilled Labour Supply

America's Chronic Shortage of Construction Labour
One of many reasons is the existing and intensifying shortage of skilled labour in the United States for site-building and construction. This is well documented. Numerous surveys identify skilled trades and semi-skilled labour shortages as being among the top concerns of many homebuilders and industrial/commercial construction firms in the United States.

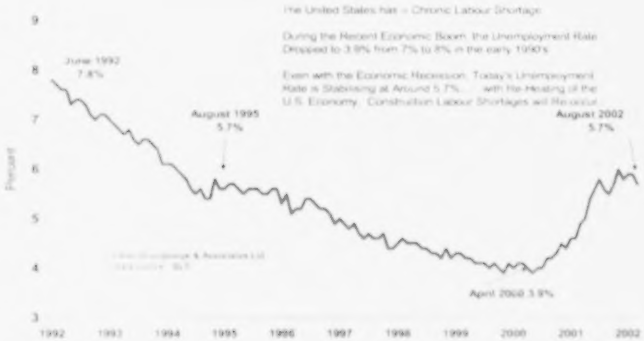
The extent of the looming problem can be gauged from demographics and immigration trends. Retirement of 'baby-boomers' over the next decade and beyond will mean that labour market growth will rely on a smaller cohort of 'Gen-Xers'. In addition, for the past decade, the US has signaled a more restricted approach to immigration — even before 9/11.

US immigration rose to a peak in the late 1980's and early 1990's. At the highest point, 1.8 million immigrants were admitted in 1991. By 1999, immigration levels had dropped to an annual rate of 640,000 persons. Whereas, over the past twenty years, the US has admitted an average of over 800,000 immigrants annually, recent trends indicate a much lower level of immigration (Chart 84).

Coupled with adverse internal demographics, the implications for US labour market growth are not favourable for the American homebuilding and construction sectors.

Chart 84

U.S. Unemployment Rate



The United States has a Chronic Labour Shortage

During the Recent Economic Boom, the Unemployment Rate Dropped to 3.9% from 7% to 8% in the early 1990's

Even with the Economic Recession, Today's Unemployment Rate is Stabilising at Around 5.7% ... with Re-Heating of the U.S. Economy, Construction Labour Shortages will Re-occur

Further evidence of looming shortages of skilled and semi-skilled labour in the United States is provided by current unemployment data. Normally, during US economic slowdowns and recessions, the unemployment rate rises well above the levels that prevail today.

During the recent economic boom in the US, the unemployment rate dropped below 4% in 2000 (annual rate) from an average 7% in the early 1990's. In the recent economic slowdown / recession, the U.S. unemployment rate did not rise beyond 6%[52].

Many observers believe that with the US economy reheating, labour shortages will be renewed. In critical sectors, such as construction, the problem could cause significant increases in site labour costs and new home prices.

Canada faces a similar skills-shortage profile based on parallel demographics. However, there are good reasons to predict that Canada's wood products industry may be able to help solve the US problem of skilled and semi-skilled construction labour shortages.

Overall, it can be expected that the response of the North American homebuilding industry inevitably will be to invest capital to replace labour. With greater automation, there will be opportunities to locate larger scale plants (along with smaller outsourced feeder operations) in various areas of North America, including Ontario.

The Challenge

Programs and funding for education, skills training and technology transfer (ESTT) should receive a high priority provided that they are focused on emerging and growth sectors of the Ontario wood products economy.

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[52] U.S. Bureau of Labor Statistics. www.bls.gov

Recommendations

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Recommendations

We present our recommendations under several headings, as follows. The priority of these reflects the goals of the report as laid out in the Phase II terms of reference:

1. Identification of market opportunities in the US Great Lakes region for Ontario's manufacturers of the three groups of selected products;
2. Identification of constraints to achieving these goals, and solutions to overcome these constraints;
3. A *Follow-Up Plan* to assist Ontario's Living Legacy Trust (LLT) in its policy initiatives.

Competition and Confidentiality

In view of competition between various jurisdictions for economic development and the attraction of job-creating new enterprises and capital investment, Volume 4 *Opportunities Report* is available only to firms that have operations within Ontario.

1. Identification of Market Opportunities

These have been presented in considerable detail in the four volumes of this report in an easy-to-read format designed to assist firms in their market research and strategic planning relating to the opportunities.

Recommendation #1

We recommend that *The Living Legacy Trust* should make the Phase II reports widely available to Ontario's wood product and value-added manufacturers.

This is the Trust's stated intention. Open workshops for the industry to hear and discuss preliminary findings from Phase II were held at Thunder Bay (June 17th 2003) and at Barrie (June 24th 2003). These events were widely publicized and well attended by a broad cross-section of stakeholders.

However, many others are not aware of the reports' existence. It may be to their benefit to be aware that the reports are readily available to them.

Recommendation #2

We recommend that *The Living Legacy Trust* should consider additional means of communicating to the Ontario industry and various stakeholders, the findings and market research data available in the Phase I and Phase II reports.

Recommendation #3

We recommend that CEOs and other industry leaders in Ontario wood products and value-added manufacturing sectors, along with the Ministry of Natural Resources (MNR), be encouraged to utilize this report and others to develop a private sector *vision* of the sector's growth potential and an *action plan*, as a means of influencing public policy.

Recommendation #4

We recommend that the Value-Added Committee and Board of Directors of The Living Legacy Trust give urgent attention to the administration of this process. Specifically, to make recommendations to the Government of Ontario for continuity of the Trust's value-

added wood products manufacturing initiative beyond the Spring 2004 sunset on the Trust's activities.

We are unable to identify within Ontario any alternative means of carrying these initiatives forward. In the Executive Summary, we point out the positive economic and social impacts that the market growth opportunities imply for the Ontario economy, both in northern Ontario and the south.

Several industry and trade associations within Ontario could play an important role in this process. But the most important commitment must come from private sector leaders of the wood products and value-added manufacturing sectors. Any initiatives will require funding.

Recommendation #5

We recommend that various industry-level marketing initiatives for eastern SPF and various value-added manufactured products, along with industry image promotional campaigns, should be included in the private sector's mandate for change.

The private sector should review the current 'poor quality' perception of Ontario softwood lumber products in the Great Lakes market area, and identify how manufacturing practices in the woods and at the mill could be changed to bring about quality improvements.

2. Overcoming Constraints

Recommendation #6

We recommend that an improved data base (e.g. directory) of value-added wood product manufacturing firms within Ontario be compiled (a) as a marketing document for the sector and as a promotion document in sales calls and (b) as a document for public policy review within Ontario.

Throughout our report, we have identified instances where potential customers simply did not know where to find products that they needed. These are lost sales opportunities for Ontario.

Recommendation #7

We recommend that investment risks and potential capital market funding sources related to the substantial upgradings and CAPEX needed for modernization be quantified as part of the CEOs' vision document and action plan.

Recommendation #8

We recommend that economic development agencies and forest-dependent communities throughout Ontario should be invited to participate in the vision process and follow-up. Specific focus should be given to the development of manufacturing synergies between northern Ontario and the south.

Recommendation #9

We recommend that the sector's skills training, education and technology transfer needs be determined as a follow-up to the CEOs' vision document.

Recommendation #10

We recommend that the CEOs' vision document should be linked with current initiatives underway, such as the *'Ontario Forest Accord'* and *'Room to Grow'* in order to ensure an

adequate commercial resource base to meet future market opportunities for Ontario's value-added wood products.

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Appendix A

Definitions and Glossary

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Appendix A

Definition of the U.S. Great Lakes Area

The U.S.Great Lakes states region comprises eight states that geographically form natural export markets for Ontario. The province has borders with the states of New York; Michigan; Wisconsin and Minnesota and is located in close proximity to the remaining states in the region; namely, Pennsylvania, Indiana, Ohio and Illinois.

Glossary of Terms Used

OSB	Oriented Strand Board / Waferboard
MDF	Medium Density Fibreboard
MSR	Machine Stress Rated (lumber)
EWP	Engineered Wood Product
LLT	Living Legacy Trust
BC	British Columbia
US	United States
NAICS	North American Industrial Classification System
SFPA	Southern Forest Products Association
OFIA	Ontario Forest Industries Association
OLMA	Ontario Lumber Manufacturers Association
FTE	Full Time Equivalent
HUD	Housing and Urban Development
R&D	Research & Development
CAPEX	Capital Expenditures
PCPI	Per Capita Personal Income
SIPs	Structural Insulated Panels
EWF	Engineered Wood Floor
MHI	Manufactured Housing Institute
USITC	U.S. International Trade Commission
SPF	Spruce-Pine-Fir

SYP	Southern Yellow Pine
LVL	Laminated Veneer Lumber
SCL	Structural Composite Lumber (same as LVL)
LSL	Laminated Strand Lumber (eg. TimberStrand, see page 72)
LSL	Laminated Structural Lumber (eg. Anthony Power Beam® LSL
PSL	Parallel Strand Lumber (eg. Parallam)
SME	Small and Medium Enterprises
NAREIT	National Association of Real Estate Investment Trusts
SLA	Softwood Lumber Agreement
FJ	Fingerjoint
VA	Value-Added

Appendix B

Descriptions of Structural EWPs and Building Components

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Appendix B

Description of Structural EWPs and Building Components

Wood Components: Applications and Main Structural Products Used

Application	Product
Roof Rafters & Joists	Lumber rafters Metal plate connected lumber trusses Truss-rafter combinations Structural insulated panels (SIPs) Wood beams and purlins Steel rafters and trusses Fingerjointed lumber Stress rated (MSR) lumber
Roof Beams	Built-up dimension lumber Solid wood beams Glulam LVL Parallam LSL (TimberStrand) Open-web joist (parallel chord truss) Steel I-Joists
Floors	Cast-in-place concrete Pre-cast concrete Steel floors Lumber joists Wood I-Joists Open web joists SIPs
Floor Beams	Built-up dimension lumber Solid wood beams Glulam LVL Parallam LSL (TimberStrand) Open web joists Steel beams I-Joists
Walls	Poured concrete Concrete block Pre-cast concrete

	Insulated concrete forming systems Autoclave cellular concrete block Shotcrete Solid brick Stone LSL (TimberStrand) Wood I-Joists Dimension lumber LVL Panelized walls Modular walls SIPs
Headers	Built-up dimension lumber Solid wood beams Glulam Wood I-Joists LVL Parallam Concrete Steel Glued and nailed box Wood truss LSL (TimberStrand) Flitch plate beams

Based on NAHB *'Builder Practices Report'* and Woodbridge Associates research